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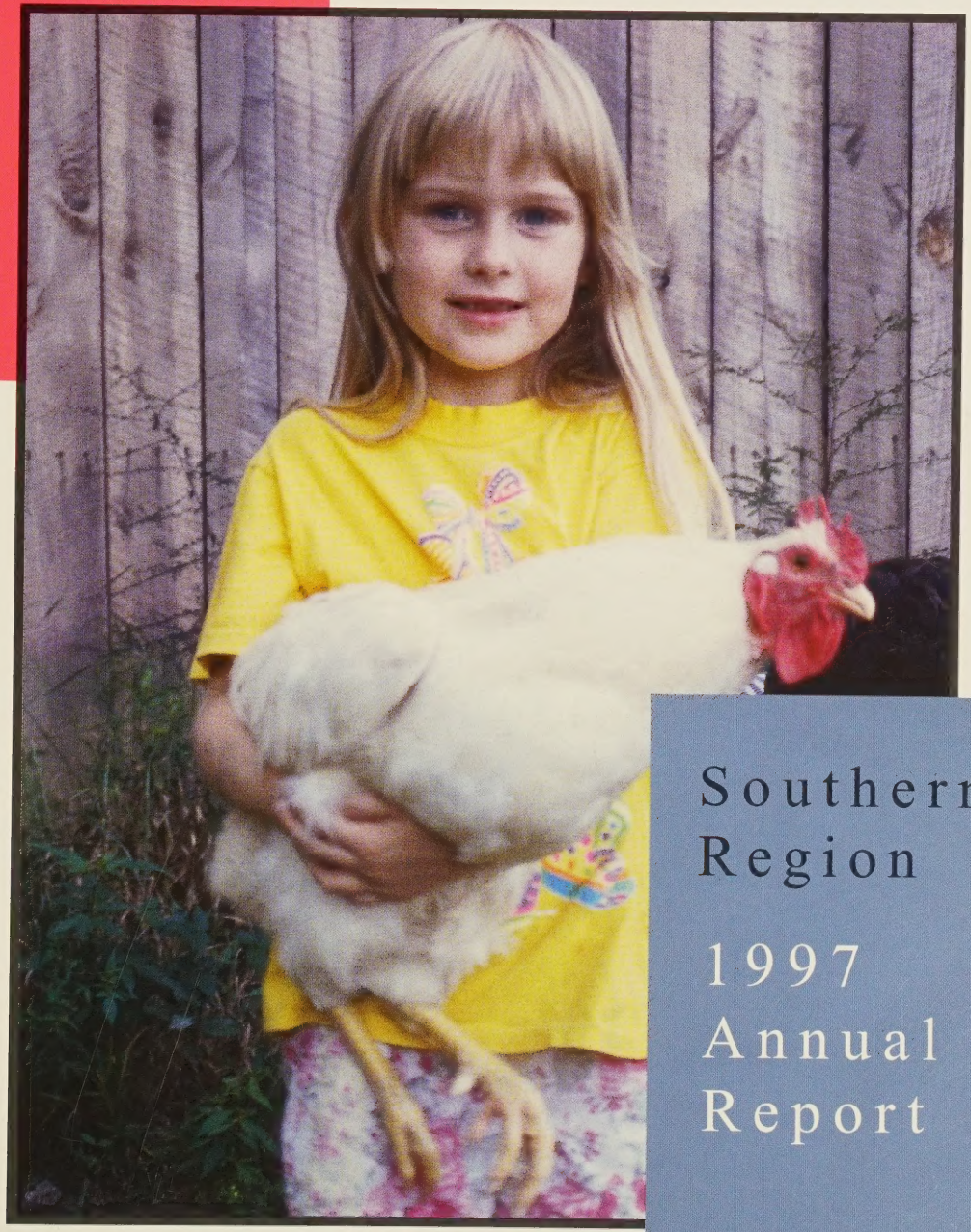
Sustainable Agriculture Research & Education

Sustainable Agriculture Research and Education
SOUTHERN REGION

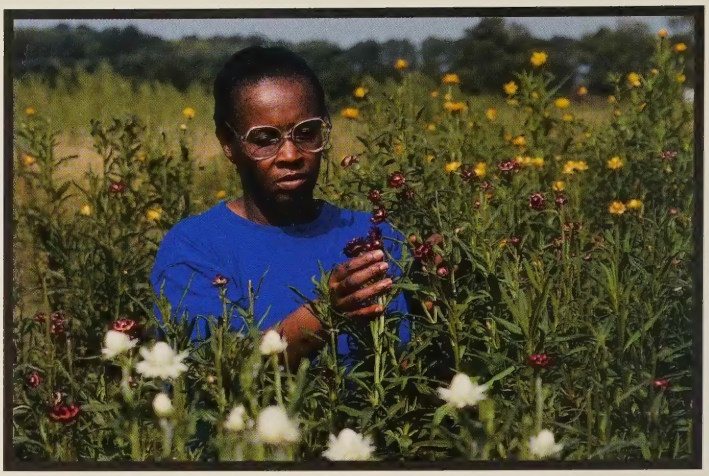


Southern Region 1997 Annual Report

(Front cover) Sarah Rogers of Corbin, Kentucky proudly shows off her family's White Rock rooster from which they hope to breed their own line of pastured poultry. The Rogers are just one of more than 24 farm families who are learning to raise pastured poultry through a SARE project headed by Heifer Project International. Photo by Gwen Roland (LS96-76).

(Right) Phyllis Smith harvests dried flowers from her garden on Virginia's Eastern Shore as part of a community development project. Photo by Curtis Badger. (LS96-80)

(Below) Sorghum plays a role in two Producer Grants in Oklahoma. Photo by John Mayne. (PG95-22, FS97-63)



(Above) Extension agents and farmers exchange experiences during a Professional Development Program training on a plantain farm in Puerto Rico.

(Above) Sharon Lawson of Mountain Hobby Cheeses demonstrates goat cheese production at a workshop sponsored by the Virginia Association of Biological Farming. Photo by Vicki Dunaway. (LS97-83)

(Left) Vicki Stamback is using a Producer Grant to extend the seasons for her cut flower business. Photo by John Mayne. (FS97-60)

Acknowledgments

The Southern Region 1997 Annual Report was accomplished through a cooperative effort in keeping with the SARE philosophy. Writing, editing and design were done by Gwen Roland. Project summaries were written by the project coordinators except for the Producer Grant summaries which were written by Dr. John Mayne. Project photos were taken by project participants, Dr. John Mayne or Gwen Roland. Printing was done by National Graphics of Atlanta.

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What is SARE?

SARE was initiated in 1988 and is currently authorized under Chapters One and Three, subtitle B of title XVI of the Food, Agriculture, Conservation and Trade Act of 1990 (FACTA) to promote research that expands knowledge about sustainable agriculture systems.

The mission of the SARE program is to stimulate research and education activities that will increase knowledge and extend information about sustainable agricultural systems.

SARE funds three types of projects:

Research and Education Projects were the original recipients of SARE funds in 1988. These generally are led by interdisciplinary, multi-institutional, multi-state research teams that include farmers as participants. These projects are administered jointly by the University of Georgia and Fort Valley State University.

Producer Grants were started in 1994 to take advantage of producer experience and knowledge. These projects are designed and conducted by producers. Funded for up to $10,000, they are generally located in one state, often on one farm. These projects are administered jointly by the University of Georgia and Fort Valley State University.

Professional Development Projects were implemented in 1994 to train agricultural information providers in sustainable agriculture techniques and concepts. These projects are administered by North Carolina State University, ATTRA and North Carolina A & T University.

Greetings from the helm

Dear Friends of SARE:

In 1988 the challenge before us was to build a seaworthy vessel called SARE and sail her at the same time. I was privileged to be among those drawing up the blueprints and hoisting the canvas. It was the strength and conviction of the sustainable agriculture movement that enabled her to push off the shore and set sail in uncharted waters. After weathering a few storms at sea, we have completed the first leg of our maiden voyage.

In March of 1998 we will celebrate SARE's 10-year birthday. As an architect, crew member and passenger on this ship, I can testify to the life changing experience it has been for me and my region. Due in a large part to the SARE program, sustainable agriculture is alive and well in the South.

In SARE's early days, we were struggling to define sustainability and to translate that into our calls for proposals. Now that we understand a bit more about what sustainability means in a southern context, we have progressed to refining the calls to ensure that our research and training programs embrace a holistic and systems approach. This year we hosted a workshop to determine what *systems* means in the context of sustainable agriculture and within our funding limits. Next year, the results of that workshop will be integrated into the new call for proposals.

The Southern region is perhaps the most diverse region in the nation, both in its agriculture and its people. In the SARE program we have taken great pains to ensure diversity on our council, committees, technical review groups, and in our portfolio of grants.

SARE will stay afloat to chart new courses if we continue to embrace our region's diversity. We must remain efficient and responsive in meeting the needs of southern agriculture, even with scarce dollars. Our business processes must remain transparent, and our support of the farmers we serve must remain staunch. We must continue with good science and good communication to the people who put that science to work.

Last of all, I commend our staff. They have formed a good team and work beautifully together. Each has deep commitment to the program and brings energy and talent to the table. It has been a real pleasure for me to serve in this great organization. Thanks for the opportunity.

Sincerely,
James E. Horne, Ph.D.
1997 Chair, SARE Administrative Council

Research and Education Project Summaries

SARE
Sustainable Agriculture Research and Education
Southern Region

LS93-52
Final Report
December 1997

Utilization of Dairy Manure in Low-Input, Conservation Tillage Animal Feed Production Systems

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Objectives

Manures are often viewed as waste products that must be disposed of, rather than the nutrient-rich resources that they really are. All too often, manure nutrients are not taken into account after application to cropland. Producers often spread manure to dispose of it and follow that application with full rates of inorganic fertilizers. While this usually results in good crop yields, environmental problems can occur. Excess nitrogen can leach toward groundwater resources and both nitrogen and phosphorus can be lost to surface waters in runoff, causing potential eutrophication problems. This practice also represents a waste of resources and capital, in the form of purchased fertilizer inputs, for the farmer.

The objectives of this research project were to:

1) Monitor the long-term residual impacts of manure applications on corn silage growth and soil properties.

2) Evaluate the potential impact of manure applications on off-site surface and subsurface water quality.

The information from this research is helping us to refine manure application recommendations for Tennessee and surrounding regions. Current manure application recommendations in the state of Tennessee are based on information from other regions of the USA.

Approach

The research was conducted on plots at two University of Tennessee agricultural experiment stations and two cooperator farmer locations. The Experiment Station sites were the Martin Agricultural Experiment Station in Martin (northwest Tennessee) and the Dairy Experiment Station in Lewisburg (south-central Tennessee). The plots at Martin had not received previous applications of manure, while the Dairy site has been manured frequently for nearly 40 years. The farm sites are both working dairies, one near Martin, and the other south of Lewisburg. Plots were established in 1993 at the university experiment station sites and in 1994 at the farmer sites. The experiment at the experiment stations consisted of 17 treatments: a 0-fertilizer check, three rates of N as NH_4NO_3 (75, 150, and 225 lb N/acre), and three rates of manure N (100, 200, and 300 lb manure-N/acre) applied for either 1) three consecutive years, 2) two consecutive years + no application in year three, or 3) the first year with no application for years two and three. To provide a tillage comparison, the 150 lb ammonium nitrate-N/ac and the 200 lb manure N/ac treatments applied for one, two, or three years were established with conventional tillage (chisel + disk + harrow) and no tillage.

In the fourth year, no manure was applied to evaluate any residual effects that the manure applications may provide. Manure rates were derived using the assumption that 75% of the N applied as liquid manure would be available for plant use in year one. This resulted in an estimated availability of 75, 150, or 225 lb N/acre which matches the inorganic rates. The 150 lb/acre rate corresponds to the high end of N recommendation rates for corn in Tennessee. Inorganic P_2O_5 and K_2O were applied to the inorganic fertilizer N plots according to soil test recommendations. Manures and fertilizers were applied prior to tillage and planting operations. On no-till plots, the manure was surface applied with no further incorporation. Smaller versions of this experiment were established on two cooperator farm sites, one in each region. The treatments were scaled down to the following 11 no-tillage treatments: the 0-fertilizer check; the 150 lb NH_4NO_3 N/acre treatment; and the 100, 200, and 300 lb manure N/acre treatments for one, two or three years.

To evaluate manure impacts on water quality, a second series of plots were established at each station. Treatments at the Martin site include four rates of liquid dairy manure (113, 225, 338, and 450 lb N/acre; 2/3 applied each spring before corn, 1/3 in fall prior to hay crop), one NH_4NO_3 rate (195 lb N/acre; 150 lb prior to corn, 45 lb prior to hay crop) and a control (0 lb N/acre). At Lewisburg, the 338 lb N manure treatment was omitted due to lack of space. The applications range from deficient to excessive N rates; however, the high application rate is not uncommon for dairy operators in these areas. Corn for silage was no-till planted on all plots each spring, followed by an annual ryegrass-clover winter cover at Martin and orchard grass cover at the Dairy Station. These

Project duration
4 years

Budget

SARE	$90, 635
ACE Matching	$36,123

crops were harvested for haylage in the spring prior to corn planting. Instrumentation was installed beneath each plot (at a depth of three feet) to enable the collection of water leaching through the soil and out of the root zone. After every storm, leachate is analyzed for nitrate-nitrogen and other constituents, such as phosphate. Also, plots from the 225 and 450 lb manure-N and the 195 lb inorganic-N treatments at Martin were instrumented with surface water collection equipment for determining runoff volumes and N and P concentrations in runoff.

Results

The data for the residual experiments indicate that prior manuring history will affect the availability of N. At Martin, yields of silage corn were much lower for second and third year corn grown on plots receiving manure only during 1993. For soils receiving manure for two years, the yields in the third year were still well below those for normal rates of inorganic-N applications (168 kg N ha^{-1}). Manure applications of 224 or 336 kg N ha^{-1} for three years resulted in yields equal to those from the inorganic control. However, there was little impact of three years of manuring on silage production in the fourth year. Fourth year yields were significantly lower from plots receiving 300 lbs manure-N for three years than from those receiving the inorganic N. However, the soils at the Dairy Station have received manure for many years and have shown no response to added fertilizer or manure-N for the past four years. Soils with no manure or fertilizer application have consistently produced silage yields equal to those from soils receiving 225 lb fertilizer N. This site has been manured for nearly 40 years, and illustrates the potential for over-application of nutrients when using both animal and inorganic sources of N simultaneously for a number of years.

Both on-farm locations observed good yields with applications of 200 lb manure-N/acre after three years. There were no statistically significant differences between the 150 lb fertilizer N and the 200 lb manure-N treatments in the third year. The results from the Martin Experiment Station and the two farm sites indicate that the repeated application of approximately 200 lbs N as manure per acre will result in yields equivalent to those from 150 lbs of ammonium nitrate nitrogen. There were no differences in yields between no-till and conventional-till treatments, indicating that nutrient availability from manures in no-till corn is not likely to be a problem.

Water quality monitoring at Martin has indicated that rates of manure nitrogen as high as 225 lbs per acre result in yields comparable to those using recommended rates of inorganic N fertilizers 150 lb/acre) with no significant impact on nitrate-N concentrations in the leachate. Cumulative nitrate-N losses are much higher from plots receiving 450 lb N per acre per year, and may pose a problem. Observations at the Dairy Station for the last few years indicate that there is appreciable N being made available from prior manure additions, and leaching losses have occasionally been unacceptable even from 0 N control plots. Again, these data indicate that we will need to closely evaluate the previous history of a farm when deciding how much N or P we will add in any form. Runoff water volumes are generally lowest from the high manure treatment. Large amounts of organic materials on the soil surface have apparently resulted in higher rates of infiltration into the soil. N and P concentrations are higher in the runoff from the 450 lb manure-N treatment, but total losses of N and P are not different than from the 225 manure-N and the 195 lb inorganic-N treatments, due to lower runoff volumes.

Impact of results

These results are already impacting informal recommendations on manure applications in Tennessee. Applications of manure to provide 200 to 250 lbs of manure-N/acre result in yields equivalent to those from recommended inorganic-N rates. In addition, these rates of manure have not resulted in adverse impacts on subsurface or surface water quality, as measured by total nitrogen or phosphorus export from the soil. Extension specialists are currently sharing this information with county agents by word of mouth. Extension bulletins will be released with this information in the near future.

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Southern Region

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Sustainable Whole Farm Grain/Silage Production Systems for the Southeast

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Project duration
4 years

Budget
SARE $240,639
ACE
Matching $218,600

Objectives

1.) Develop profitable alternatives, using white lupin, tropical corn, and hybrid pearl millet to current grain and silage production systems employed by farmers in the Southeast.

2.) Develop sustainable systems utilizing these alternative crops that integrate into diversified (crop/livestock) farming systems and result in reduced pesticide and fertilizer inputs and conservation of soil, water and energy.

3.) Determine the profitability of production systems using these alternative crops as compared to traditional systems currently employed by farmers in the Southeast and disseminate this information to farmers through farm meetings, popular press articles, extension publications, videos and television.

Approach

Coordinated experiments were conducted at five locations in Alabama, Florida, and Georgia extending from the panhandle of Florida to the northern edge of the Coastal Plain in central Alabama. The core experiment was a cropping systems experiment of six cropping systems in conjunction with four rates of nitrogen (N) fertilizer applied to the summer crops in the systems.

Cropping systems are:

1.) Wheat/soybean
2.) Wheat/tropical corn
3.) Wheat/pearl millet
4.) Lupin/soybean
5.) Lupin/tropical corn
6.) Lupin/pearl millet

Nitrogen treatments on summer crops were 0, 60, 120, and 180 lb N/acre. This brackets recommended N rates for these crops under rainfed conditions.

Samples to determine the changes in amounts of nitrogen in the plant/soil system were taken from the beginning of the study in 1993 until the end of the study in early 1997. Data from laboratory analyses of plant tissue and soil N are still being summarized. This data will provide information on N utilization efficiency of the systems and allow inferences to be made as to losses of N to the environment via denitrification, runoff and leaching. Whole plant samples of lupin, pearl millet, and tropical corn were collected at appropriate growth stages for each crop for silage yield determinations. Silage quality from these crops were determined (measurements of DM, ADF, NDF, IVDMD, CP, and Ash, and ensiling evaluation-pH, DM, lactic acid in laboratory mini-silos) each year. Data collected includes yields and all production inputs and values necessary for accurate economic analyses. Enterprise budgets are being developed to determine the most economically viable cropping system.

In addition to the primary test, separate but coordinated studies include:

1.) Experiments to determine the optimum planting dates for tropical corn and pearl millet;

2.) Animal feed trials to evaluate silage of the three alternative crops—tropical corn, pearl millet, and lupin;

3.) Experiments to determine the effectiveness of the biological insecticide, *Bacillus thuringiensis* Berl., for control of fall armyworm in tropical corn;

4.) Characterization of potential insect pests of pearl millet;

5.) Evaluation and screening of new lupin germplasm;

6.) Evaluation of the potential forage value of new pearl millet hybrids;

7.) Determination of optimum soil pH and phosphorus needs of pearl millet;

8.) The role of phosphorus nutrition in seed quality of white lupin.

Results

Results varied over the project due to location, year, and environmental conditions. In summary, data indicated that:

i) Wheat yields demonstrated a variable response to previous summer rotation crop, but were generally greater following soybean. However, equivalent yields were obtained following millet and tropical corn, provided the summer grain crops were fertilized with 120 to 180 lb N/acre;

ii) Soybean yields were reduced from 11 to 23% following lupin;

iii) Lupin silage averaged from 2.4 to 11.8 tons (35% DM) and grain yields averaged 0 to 34 bu/acre. The experimental design and N balance objectives required that lupin be grown in the same plots every year. Diseases, espe-

cially anthracnose, were increased by the lack of rotation. Optimum planting time for lupin is 4 weeks before the first 28 °F freeze in fall. Lupin (even failed crops) demonstrated a positive rotation and N response for tropical corn and millet. Lupin are relatively insensitive to acid soils but respond to adequate P fertilization. Lupin as a green manure supplied sufficient N for a 20.5 tons/acre silage crop of tropical corn;

iv) tropical corn silage ranged from 4.9 to 26.8 tons/acre, dependent on previous crop and N fertilizer rate. Grain yields ranged from 24 to 100 bu/acre; **v**) Millet silage yields ranged from 4.3 to 27.5 tons/A, dependent on location, N rate and previous crop. Millet grain yields ranged from 15 to 129 bu/acre. Following wheat, 120 to 180 lb N/acre was required for maximum yields. (54 bu/A). Dependent on location, previous crop, and N rate, millet grain yields ranged from 15 to 129 bu/acre. Millet yields were up to 43% greater following lupin than wheat. Bird predation is a problem on small acreages. Millet yields were greater when drilled. Optimum pH is 6.0-6.5 for millet and millet responds to high levels of soil P;

vi) All three crops can be ensiled satisfactorily. Tropical corn and millet silage had similar energy and protein content to temperate corn silage and lupin silage was lower in energy but higher in protein than other silages. Dairy cows on lupin silage based diets had the same milk production as those on temperate corn silage diets while cows on millet and tropical corn diets produced less milk.

Impacts of results

Our results show that pearl millet is a potential silage crop and a viable feed grain crop for double-cropping systems in the southern USA. A new race of rust in 1993 curtailed late plantings of the crop, one of its strong points. A good multi-gene resistance to this race of rust has been developed and a new rust resistant hybrid with even greater grain yield potential than the variety used in this study (HGM-100) is scheduled to be commercially released, probably in 1999.

As a result in part from this project and satellite projects, there is a tremendous amount of interest in using lupin as a cover crop for cotton production in the Florida panhandle, southern Georgia and Alabama, South Carolina and North Carolina. Resource Seeds (Visalia, CA) is currently increasing a high alkaloid selection from 'Tifwhite-78' (a USDA-ARS release) white lupin seed for this purpose.

The Auburn University cooperator, Edzard van Santen, is also increasing seed of a selection of high alkaloid 'Tifwhite-78' lupin to be used as a cover crop. A high alkaloid type would be a better choice for a cover crop/green manure in that alkaloids protect the plants from pests and some diseases. Also, there is research to indicate that high alkaloid lupin may suppress certain nematodes.

Also, due to our efforts, Agricultural Resources International Seed Technology Division, Swedesboro, NJ, obtained distribution rights in the USA to market 'Lunoble' and 'Lumineux' white lupin from Agri-Obtentions, the seed company in France, which owns proprietary rights to these varieties. We furnished seed to the company for seed increase in September of 1997. We have also furnished information regarding seed sources and markets for lupin growers in Georgia and an organic beef producer who wishes to use lupin as an alternative organically grown protein source. Based on public response to articles on background research for this SARE project, the use of lupin in products for human consumption is an area that should receive further research interest. The public seems to be keenly interested in this topic and a human food market would increase the value of the crop, making it more profitable for farmers to grow.

Also, from observations that arose out of our research there is considerable interest in lupin seed to be used for wildlife food plots. This potential is currently being investigated by an Auburn University wildlife biologist.

Results to date indicate that tropical corn, lupin and pearl millet may be ensiled satisfactorily. The maturity of pearl millet and lupin have affected the nutrient content, but data indicate that these crops may be effectively used in a sustainable farming system. Lupin silage may be used in dairy diets based on similar milk production and milk composition to that from temperate corn silage based diets.

Future plans

The final soil sampling and laboratory analyses for plant and soil nitrogen has been done and the bulk of the samples have been analyzed, but data summary and statistical analysis on this data remain to be done.

All data has been turned over to the economist for analysis. He has had difficulty in obtaining a graduate student to help with the analysis, but plans to have the economic analysis completed by the end of the extension date of the project (April 30, 1998). We plan to aggressively follow up the intense interest in using lupin as a cover crop/ green manure and for wildlife plots by encouraging private seed companies to market currently available commercial varieties (Tifwhite-78 and Lunoble).

Research results need to be published and the technology transferred. The first draft of the lupin development/management guide has been developed and the script for the management video has been written and the video footage has all been taken. Germplasm improvement for hybrid millet and lupin continues.

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Southern Region

LS93-54
Final Report
December 1997

Evaluation of a Low-input, No-till, No-herbicide Continuous Grazing System for Dairy Cows

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Objectives

1.) Develop a planting scheme which would provide year-round grazing based on annual crops, which provide much higher level of nutrients than perennial grasses in the Southeast.

2.) Grow crops using sustainable agriculture methods. This includes using manure as the primary fertilizer, using no-till planting methods, and minimizing the use of chemicals.

3.) Maximize the use of grazing small grains, sorghum and alfalfa to high producing dairy cows and to reduce the amount of silage and grain fed.

4.) Economically evaluate this method compared to a system of feeding stored forages only.

Approach

This project was conducted by Clemson University at the Tom Trantham Dairy, located 35 miles from campus in Pelzer, SC. Mr. Trantham milks approximately 74 Holstein cows twice per day. Mr. Trantham farmed conventionally for many years but began to convert to a grazing-based dairy several years before becoming involved in this project.

Mr. Trantham is enrolled in the Dairy Herd Improvement Association (DHIA) and his Rolling Herd Average was 17,463 pounds of milk. This fluctuated during the course of the project and at one time was nearly 19,000 pounds. His somatic cell count was 280,000. The average pounds of milk produced during the 3-year study was 53.9 pounds per cow per day. Average milk price was $15.10/cwt. A feeding program for a 70 cow dairy herd was designed to maximize the use of grazing.

Basal ration

In addition to forage obtained from grazing, the feeding program during the project consisted of purchased corn silage and purchased grain concentrates. The amount fed depended on availability of pasture, milk production level, body weight, season of year, days in milk and milk fat percent, but in general, 25-80 pounds of corn silage and 17-25 pounds of grain were fed per cow per day.

The concentrate portion of the ration consisted of 12 pounds per cow per day of a pellet fed in the milking parlor (approximately 20% crude protein) and a custom mixture (approximately 22% crude protein) blended with silage and fed as a total mixed ration twice daily. In general, 5 to 12 pounds of the custom mixture were fed per cow per day and consisted of corn, corn distilled grain, soybean oil meal, wheat midds, soybean hulls, whole cottonseed, minerals and vitamins. In order to maximize dry matter intake from grazing, the amounts of silage and custom grain were reduced prior to placing the cows in each paddock. The amount could be lowered additionally while grazing a paddock if milk production remained steady or was increasing. If however, milk production dropped, the amount of grain and/or silage would be increased accordingly. Balancing the available grazing with grain and silage was a critical daily management decision.

The purchased corn silage was delivered to the farm and ranged in price from $36 to $42 dollars per ton. Both the pellets and the custom grain mixture were booked at various times throughout the project for various prices. The pellets ranged from $158 to $186 per ton and the custom mixture ranged from $151 to $228 per ton. It should be noted that the higher feed prices reflected the tremendous increase in feed prices during late 1995 and 1996.

Grazing

Mr. Trantham's dairy farm consists of 95 acres, 50 of which were available for grazing the milking string. These 50 acres were divided into 8 permanent pastures for the cow herd plus one pasture for heifers. Movable fence was used to further subdivide each pasture into smaller paddocks. The size of the paddocks was dependent on the amount of forage available. This farmstead was ideal for converting to a pasture system because of its layout. The farm buildings were centrally located and the pastures were on the perimeter of the farm. No pasture was more than a 10-15 minute walk from the barn. Cows have access to woods from all pastures except 1 and 8. Cows were not left in pastures 1 and 8 for extended time periods during hot weather since they did not have access to shade. Sustainable agriculture techniques are utilized including no-till planting and manure is the main source of fertilizer. Use of herbicides and chemical fertilizers was been minimized. The paddocks were rotationally grazed.

A system was designed with the goal of uti-

Project duration

3 years

Budget

SARE	$118,911
ACE Matching	$62,700

lizing grazing during as much of the year as possible. Rye, ryegrass, clovers, wheat, and triticale were planted in the fall and provided fall, winter and spring grazing. Several varieties of millet and sorghum were planted during late spring and early summer and provided summer and fall grazing. One pasture was planted in grazing alfalfa after the first year and was grazed during the spring, summer and fall of 1995 and 1996.

The amount of forage available varied considerably. Irregular rainfall throughout the project was a major factor contributing to the varying amount of forages produced. When a field was ready for grazing, cross fencing was used to subdivide the field into smaller paddocks if warranted. The amount of days each paddock was grazed varied from as few as 2 days up to 12 days.

Results

Results showed that the cows grazed the most nutritious parts of the plants. The neutral detergent fiber (NDF) of the crop offered (whole plant) averaged 59.41% but the portions that the cow ate were only 54.1%. This same trend was true for acid detergent fiber (ADF); the ADF content of the feed offered to the animals was 31.9% but the ADF content of what they actually ate was 29.0%.

This indicates that the cows ate the least fibrous portions of the plant. Conversely, the cows ate portions of the plant higher in crude protein (CP) than the whole plant contained, 24.4% versus 20.0%. These data illustrate one of the unique advantages of grazing. Had the cows been fed the same crops as harvested feed, they would have been fed a much lower quality product and would have had to expend energy digesting lower quality forage.

On days that cows grazed, they consumed an average of 9.6 pounds of dry matter per cow per day, which is approximately 25% of their dry matter requirement. When all costs associated with grazing were calculated, data for the three years of this study showed that grazing saved an average of $.31 per cow per day on days when cows grazed when all costs including fixed costs are included.

Since the cows grazed a total of 689 days out of 945 (73%), the total savings from grazing was $15,805.66 for an average of 74 cows. If only variable costs are included, grazing saved an average of $0.63 per cow per day over what it would have cost to feed this herd harvested feeds only. This might be the proper scenario for someone to consider if they already have all the necessary equipment and want to know how converting to a grazing system would affect their operating expenses.

Grazing winter annuals was shown to have an economic advantage of grazing summer annuals. This is not surprising since the weather in our region is much more consistent and desirable in the winter. The economic advantage of grazing winter annuals averaged $0.41 per cow per day whereas the economic advantage of grazing summer annuals was $0.21 per cow per day. There was also less fluctuation in the savings realized from winter annuals. For summer annuals, cost savings ranged from -$0.48 per cow per day in 1995 to $0.75 per cow per day in 1994 whereas the range in savings for winter annuals was from $0.23 in 1994 to $0.59 per cow per day in 1995.

Overall, it was financially advantageous to graze cows instead of feeding stored forages. There was, however, a wide range in results, and there were several times when the costs associated with establishing the crops were not recovered. This was usually due to adverse weather conditions.

The major problem associated with this project was unfavorable weather conditions. We did not have the capacity to irrigate pastures, so we often lost summer crops due to droughts. However, this is what farmers must live with, so the data is very realistic.

Impact of results

This project has received a lot of publicity and notoriety. We have received calls from dairy farmers all over the southeast interested in the project. The results clearly demonstrated that a low-input grazing system can be cost effective, especially when winter annuals were used. This type of system could be the key for survival for small family dairy farms in the southeast.

SARE
Sustainable Agriculture Research and Education
Southern Region

LS93-55
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Cover Crop Integration into Conservation Production Systems

Project Coordinator
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Participants continued on next page

Project duration
5 years

Budget
SARE $135,540
ACE Matching $117,040

This project will make cover crops more attractive by reducing their cost and developing easier ways of managing them. Specific objectives are:

1.) Identify legume cover crop germplasm with superior reseeding characteristics

2.) Demonstrate practical management systems that reduce the need for herbicides in no-till and low-till crop production.

Approach

Cover Crop Nursery Evaluations: Legume cover crop germplasm were screened at several locations representing a range of soil types and climatic zones varying from the gulf coast to northern Tennessee, and from Georgia to western Arkansas. 'Tibbee' crimson clover was used as a standard against which 17 other cover crops are compared seeking a superior combination of winter hardiness, vigor, early maturity and hard seededness. Additionally, over a two-year period seed of one promising new legume cover crop, balansa clover (*Trifolium balansae*), which was identified in this project as possessing superior reseeding potential, was distributed to fifteen farmers who responded to articles in *Common Ground* and *Agriculture Research* magazines for evaluation on acre-sized areas. A follow up survey was sent to these producers to obtain input and many responded.

Seed increase of another promising reseeding, spotted burclover (*Medicago arabica* (L.) Hudson) continued in cooperation with the USDA-NRCS Jamie Whitten Plant Materials Center in Coffeeville, MS. Detailed observations were made of the growth of spotted burclover in order to relate time after flower blooming to the production of hard seed.

Management System Evaluations: Management systems being evaluated in replicated-plot and on-farm studies include demonstrating mechanical killing cover crops ahead of no-till planting cotton and other crops, testing planter attachments to facilitate the planting of cotton through the cover crop residues, and evaluating the ability of the residue mulches to reduce weed competition with summer crops. A Mowing Date Study compared mowing vetch, rye, or rye plus vetch 0, 2, 6, 14, or 26 days ahead of no-till cotton planting in early May and tested four commercial residue management planter attachments. A Cover Crop X Weed Control Study compared four winter cover crops (vetch, rye, rye plus vetch, or volunteer vegetation) and four weed control treatments (ranging from no-till with broadcast preemergence and postemergence herbicides to a minimum herbicide treatment involving mechanical and flame cultivation) for cotton production. Soil temperature, cotton growth, and weed populations are measured. On-farm evaluations were conducted in cooperation with Steve McKaskle in Braggadocio, MO; Steve Parks and Lorna McMahon in Tiptonville, TN; David Denton in Tyronza, AR; and Jim Whitfield in Yazoo City, MS.

A video describing the work done in this project was finalized and distributed. The project coordinator participated as an editor of the revision of the SAN cover crop book so that the information gained in this project are reflected there.

Results

Reseeding legume cover crops: This work identified two promising new legume cover crops: southern spotted burclover and 'Paradana' balansa clover. Both these cover crops mature seed slightly earlier than crimson clover, although they often do not produce as much biomass. Their big advantage over crimson clover is their ability to reseed for several years from a single seed crop. Both have volunteered back for four years following maturation of a seed crop in 1993 in Senatobia, MS and they have also reseeded successfully for at least two years was at several other locations in AL, GA, and MS. Neither Tibbee nor 'AU Robin' crimson clover reseeded for more than one year at any location.

Unlike crimson clover, whose flowers open nearly at one time, spotted burclover, like other medics and subterranean clover, flower over a period of several weeks, producing clusters of three to five flowers on successive main stem nodes about 2.5 to 3 days apart. Although burs reached nearly maximum size by 14 days after bloom, seeds continued to accumulate mass for about 50 days. About 50% of seeds became viable and hard after about 30 days. This percentage increases to nearly 90% by 40 days.

Insect pests, the clover leaf weevil (*Hypera*

punctata Fabricius) and the alfalfa weevil (*Hypera postica* Gyllenhal), preferentially attack medics over other winter legume cover crops and delay and reduce seed development. Cold and insect damage to the local spotted burclover accession has not been as severe as to the commercial (Australian) annual burclovers.

Because insect feeding often damages later burclover flowers, most of the productive flowers open within the first 10 days of first bloom. Thus most seed is formed by 40 to 50 days after first bloom. If first bloom occurred on 23 March, this translates into a viable seed crop by 2 May, and maximum seed formation by 12 May. By allowing the cover crop to grow until the 40 to 50 days after first bloom and managing the cropping system without tillage that would bury burclover seeds too deeply, spotted burclover should successful reseed for several years.

Although no insect control measures were taken and insect damage did not eliminate reseeding in these studies, in a commercial seed production enterprise or in the first year of seeding a cover crop, insect control when weevils are in their second instar growth stage, possibly using pyrethroid insecticides or parasitic wasps, would significantly increase seed yield if weevil pressure is heavy..

Regional evaluation of balansa clover by producers resulted in mostly favorable reviews. Most farmers managed the clover as a forage crop rather than as a cover crop. Several correspondents also noted that it seemed to be favored by honey bees.

Mechanical control of cover crops: Mowing was effective in killing rye and vetch cover crops during late April. Cover crop residues dry rapidly after mow-killing. Use of tined-wheel row cleaners enabled successful no-till cotton planting only two to six days after mow-killing dense cover crops, but row cleaners became wrapped up with vegetation when planting was done the same day as mowing while the residues were still moist and flexible at Steve McKaskle's farm.

Heavy cover crop mulches did not eliminate the need for supplemental chemical and/or mechanical weed control. However, cover crops permitted no-till cotton to be produced using a banded herbicide application comparable to that used in conventional-tillage culture.

Impact and Benefits

These studies demonstrate two ways that farmers can increase their production efficiency and build their soil quality without increasing their production costs. The farmer and society both benefit from decreased runoff and erosion losses and improved water quality.

Reseeding cover crops offer the benefits of increased organic matter inputs to soils and reductions in needs for purchased nitrogen fertilizer without the expense of seeding a cover crop each fall. If the cover crops are planted on time and managed to produce a heavy seed crop the first spring, the farmer could save $25/acre cover crop seeding costs plus $15/acre in fertilizer savings (50 lb/a) for the following three to four years even in crop rotations where cover crops cannot make seed each year.

Alternatively, planting heavy residue-producing cover crops like rye and hairy vetch can offset herbicide costs in no-till systems. These cover crops mature seed too late in the spring to reseed by themselves, so they must be planted each fall. However, they shade out undesireable species and can themselves be killed by mowing or rolling and so can permit no-till planting without the need for burndown herbicides. The resulting mulches assist with weed control so that total herbicides can be restricted to a band over the row at rates no higher than are used with conventional tillage culture. In this system, the farmer can get the soil and water conservation benefits of no-till using cover crops and pay for the cover crop planting costs with savings in herbicide expenses.

Both of these approaches benefit consumers by maintaining a cleaner environment while producing crops with maximum efficiency and minimum cost.

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SARE
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Southern Region

LS94-57
Final Report
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Disease and Insect Management Using New Crop Rotations for Sustainable Production of Row Crops in the Southeastern United States

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Project duration
3 years

Budget
SARE $152,200
ACE
Matching $52,614

Objectives

The objectives of the project were to enhance current row cropping systems in the southeastern U.S. by expanding crop rotations through the incorporation of two new crops which can be sustainable and profitable and which result in reduced damage from diseases and insects. Twelve rotation sequences were established which incorporate canola and grain pearl millet into the standard annual cropping system of wheat as the fall-planted crop followed by no-till soybeans as the summer crop.

Approach

The 12 annual rotations with wheat, forage rye, or canola (fall-planted) and soybeans or pearl millet (summer-planted) was established for the primary research plots at the University of Georgia Southwest Branch Experiment Station at Plains. Demonstration plots were located on a farm near Plains and at the Sunbelt Expo site near Moultrie, GA.

Results

Take-all was severe in continuous wheat rotations throughout the study. Take-all was just as severe following millet as after soybean. Results from the 1996 and 1997 showed that a one year rotation with canola prior to wheat had a significant effect on suppression of take-all root rot. Wheat grain yield was the same, and in most rotations test weight, and 1,000 kernel weight were the same as the non-diseased controls following canola. This was a greater yield improvement than anticipated because of the severe damage from take-all in continuous wheat during all three years. Yield components were significantly lower in rotations with continuous wheat. The possibility that the rapid decline in take-all after canola may be due to compounds released during decay of canola tissues is being investigated. Assays in a controlled environment chamber for take-all on wheat seedlings grown in soil from field plots were similar to results from field trials. The incidence of infected plants and root rot severity were greatly reduced on seedlings grown in soil from rotations with canola. Data for disease incidence and severity from the field prior to wheat harvest were similar to data from seedling assays. The beneficial value of canola in wheat rotations for take-all control has been incorporated into Extension recommendations in Georgia.

The population of Hessian fly on wheat was below economic thresholds during 1995. During 1996 and 1997, winter infestations were significantly lower when canola was rotated with wheat. By 1997 Hessian fly infestations were greater following millet than after soybean. Spring infestations were not affected by the previous crop. False chinch bugs were present in canola in the first season but could not be assessed in 1996 due to the severe winter freeze which killed canola.

Millet stands were reduced by false chinch bugs following canola in 1996 and 1997. True chinch bugs, which often damage millet seedlings after small grains, were not found. Thrips populations were higher on soybean seedlings after canola than after wheat, but thrips are not damaging to soybean. Fall armyworm, southern green stink bug, and leaffooted bug attacked whorls and seed of millet but their populations were not influenced by crop rotation. Insect pest populations on soybeans were not affected by the preceding winter crop. Only soybean loopers and velvetbean caterpillars were above economic thresholds. More lepodopterans were found on soybeans following rye. The primary effect of rotation sequence was on seedling insect pests.

The stand of soybeans was reduced 20% or more following canola each year which could not associated with insect damage. Pearl millet stands were also significantly lower after canola but not wheat. This is the first evidence that canola may have an allelopathic effect from breakdown products in canola stubble on these crops in a doublecrop rotation.

Rotation effects were significant for pearl millet panicle counts, leaf blight, and stalk and neck rot during the 1996 season. There was a trend for leaf blight and stalk and neck rot to be less severe in pearl millet following canola than following wheat. Seedling stand was positively correlated with leaf blight and stalk rot. Rotation effects on pearl millet diseases may have

been obscured by variation in stand density within subplots. Minor effects on pearl millet stand establishment, retention of green foliage, stalk and neck rot, smut, and yield were observed in these rotations. Seedling stands 3 weeks after planting were lower following canola than wheat in 1995 and 1997. Foliar chlorosis and necrosis were slightly less severe in pearl millet following canola than wheat in 1995 and 1996. Stalk and neck rot was also less severe following canola in 1996. Grain yield was highest following canola in 1997 but may be an artifact of excessive stand density. A trend toward increased smut severity in plots continuously planted to pearl millet was observed in 1997.

Canola diseases were not significant during 1995 and could not be assessed because the crop was killed by low winter temperatures in 1996. After two seasons, there were no differences in severity of stem canker on soybeans due to crop rotation or the inclusion of canola or pearl millet in the rotation. Sclerotia stem rot and black leg did not become serious during the three-year period, probably as a result of loss of the crop in 1996. The rotations will be continued in 1998 to assess rotation effects on these diseases.

Soybean yield was reduced following canola probably because of allelopathic effects from the decaying canola stems and roots. Various foliar diseases were present but did not cause economic loss in any year. Stem canker increased in severity early in the 1997 season in continuous soybean rotations but did not affect seed yields. Additional data will be collected in 1998 on rotation effects on stem canker. Canola and pearl millet were compatible with soybean in the rotation. No changes in disease management is foreseen to incorporate these crops into rotations with soybean.

Impact of results

Analyses of the income returns from the rotations was done by developing cost and return budgets for each crop by year using plot yields and field operation and input costs realized by the Southwest Georgia Branch Experiment Station. The analysis shows that crop failure and crop prices influence rotation effects on returns. These influences can magnify negative relationships such as reduced yields of soybeans behind canola, and/or shrink positive benefits such as take-all reduction on wheat from having canola in the rotation. High soybean prices and wheat prices may make the reduction in soybean returns following canola less than the increase in wheat returns from having canola in the rotation ahead of wheat. In contrast, beneficial but costly winter cover crops with no income (rye) and/or low income potential neutral crops such as millet can make a rotation unprofitable or add no positive economic benefits. However, the low income of millet could be an improvement over soybeans after canola. The results indicate the current vulnerability of the new crops canola and pearl millet. Improvements in varieties adapted to the region and improved yield potential will make these crops more profitable.

Potential contribution

Video footage showing the results of the rotations on diseases and insect pests to date in field plots have been made. Information on the procedures used and the biology and damage caused by the various pests have been documented. Aerial footage showing the plots during May to document the effect of rotation on take-all of wheat has been recorded. Film will be edited to complete the educational video based on the study. Several training programs and presentations at various meetings have been completed and additional presentations will be made in 1998. Audiences varied from small acreage to large-scale growers, extension specialists, and researchers throughout the Southeast. Several technical and nontechnical publications have been completed. Refereed journal publications are being prepared from the research on rotation effects on take-all, insect populations, and pearl millet diseases and crop yields. A comprehensive publication on the project will be prepared as a College of Agriculture research bulletin.

SARE
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LS94-58
Final Report
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Post-CRP Land Management and Sustainable Production Alternatives for Highly Erodible Lands in the Southern Great Plains

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Objectives

1.) Develop best-management plans to prepare CRP grasslands for grazing or haying,

2.) Determine the productivity and profitability of land management systems to revert successfully and environmentally sound to winter wheat and cotton production on highly-erodible lands in the Southern Plains.

Approach

The majority of contracts on 1.2 million acres of CRP lands in Oklahoma will expire in 1996, 1997, and 1998. A general lack of integrated management guidelines exists on how highly erodible lands (HEL) should be used for grazing livestock production or how to revert to annual cropping while meeting conservation compliance. Under USDA-ARS coordination, a collaborative project was conducted on two CRP fields under contract since 1987 and 1989.

The project objectives were to assess, on the field-scale, environmentally sound grazing-crop options for highly erodible CRP lands. One study site is near Forgan, OK in a 450-mm precipitation zone of NW Oklahoma. The other is near Duke, OK in a 750-mm precipitation zone in the SW. Both sites were seeded to Old World bluestem (*Bothriochlora ischaemum* L.).

Field-scale comparisons of management systems for OWB, conservation- and no-tillage wheat (*Triticum aestivum* L.), and conservation-tillage cotton (*Gossypium hirsutum* L.) production systems were made to evaluate the productivity and the optimal management of HEL after the CRP. Each of the project years, we implemented the grass and wheat recrop options in a new area of the CRP field and re-established the Year 1 (first established in 1994) and Year 2 (first established in 1995) treatments. This approach allowed us to assess the options' performance for the first time out of CRP grass and producing second and third-year crops under weather conditions of each year during the 1994-1997 period.

Small-plot experiments were also conducted to evaluate herbicides and fertilizer requirements for killing the sod and preparing the fields for reverting CRP lands to crop production. Rainfall simulations were conducted to measure runoff and soil erosion characteristics the first year following conversion of CRP to winter wheat production during 1996. During the project, we found that:

Results

1. CRP lands planted to OWB require improvements before they are used in hay or grazing livestock production. Greatest limitations are inadequate N, P, stand density, and forage quality. After the initial removal of the old growth, baseline unfertilized OWB production in 1994 averaged 3,200 and 3,600 kg /ha at Forgan and Duke, respectively. In 1995, an application of 67 kg N/ha resulted in no significant increase in forage production at Forgan. In contrast, the application of urea-N tripled OWB dry matter production over the unfertilized plots at Duke, equaling 81% of the biomass accumulated over the seven years that the field was enrolled in the CRP.

In 1996, applications of 67 kg N and 22 kg P/ha resulted in an average 1.7-fold increase in OWB forage production at both locations. In 1997, OWB forage production tripled and quadrupled by improved management and fertilizers at Forgan and Duke, respectively. Therefore, management actions are needed at the end of the contract period to convert CRP fields into productive grasslands.

Overall, minimal management action such as removing the dead grass litter in early spring stimulated forage production. Fertilizers enhanced production and forage quality for both stands. However, optimal use of OWB still depended upon a delicate balance between forage yield and peak nutritive value of the forage.

2. Our results showed the need to move back the time line that CRP landowner or operator would be permitted to work on the grass cover, if provisions for soil erosion control are in place. Timing of suppression of a warm-season grass is critical for conserving stored soil water that is vital to the success of producing a wheat crop in the year a CRP contract expires. Otherwise a year of production would be lost.

In nutrient-depleted CRP fields, fertilization was necessary to achieve agronomic yields; unfertilized plots yielded only 34 and 60% of plots receiving 112 kg N/ha at Forgan and Duke, re-

Project duration
3 years

Budget:
SARE $196,100
ACE
Matching $152,400

spectively. The amount of old dry matter removed and new regrowth is critical to how well we can perform reduced tillage, kill the growing cover, and establish a uniform crop stand.

In 1994, dryland wheat yields averaged 890 and 1,660 kg ha^{-1} at Forgan and Duke, respectively. NT wheat yields were equal to or 21% higher than CT wheat at both CRP sites, because of higher soil water storage attained with surface residues and the absence of tillage. Without prior removal of old growth, MT and burial of the sod had highest wheat yields, followed by DT, and NT at both locations, due to uniform stand, higher plant density in the clean tilled surface.

In 1995, wheat yields ranged from 190 to 880 kg ha^{-1} due to the extremely dry weather. NT was significantly better during the drought of 1995 when the crop was produced mainly from stored water and no significant rains fell between October 1995 and June 1996.

In the third year, herbicide application and tillage (sweep and disk tillage) effectively control OWB. Early chemical suppression of OWB promoted early emergence and growth of wheat during 1996 and early 1997. However, night temperatures on April 12 and 13, 1997 dipped below –6 and –8° C at Forgan and –4.5 and -6.8°C at Duke, OK. Freeze damage was extensive for the Duke wheat crop that was in the grain-fill stage of development and had a yield potential in the 2800-3000 kg ha^{-1} range. The Forgan wheat crop was not as far along in development, in the early booting stage. That wheat crop partially recovered as excellent growing conditions existed following the cold spell.

Final yields averaged 715 and 1045 kg ha^{-1} at Forgan and 580 and 910 kg ha^{-1} at Duke for conservation-till and no-till treatments, respectively. Overall, NT practices were more effective at conserving and utilizing stored soil water for crop production on former CRP fields and wheat yields were significantly higher than CT yields at both locations between 1994 and 1997.

3. Conversion to dryland cotton was not as successful as yields averaged 100 kg ha^{-1} due poor weather conditions that existed at planting and during boll-setting stage in 1995. A 1996 crop was not planted due to the extremely dry conditions that prevailed at the site and throughout the region.

In summary, climatic variability served as a constant reminder of the precarious environment and the high risk of agricultural production in the Great Plains while considering the conversion of CRP lands back to intensive cultivation of either summer- or winter-season crops.

4. No difference in cumulative runoff was found between grass and wheat treatments under simulated rainfall at an intensity of 65 mm $hour^{-1}$. Significant differences in surface cover existed between undisturbed CRP, grass regrowth after burning, conservation disk-tilled, and no-till wheat treatments at Duke, OK on June 13-18, 1996. Surface coverage values ranged from 42, 71, 79, and 100% on disk-tilled, no-till, and OWB regrowth, and undisturbed OWB treatments, respectively.

The data suggested that conversion of this CRP site to winter wheat production using no-till and disk-till management practices did not enhance runoff or reduce water infiltration. However, soil loss in disk-tilled plots was 3 to 4 times greater than no-till wheat and OWB plots, averaging 210 kg ha^{-1}, compared to 58 kg ha^{-1} for no-till and OWB treatments. Although differences in soil erodibility existed, conversion to wheat production would not result in excessive erosion during the first year of production using the disk-tillage practices to destroy the sod.

5. Using regional custom rates, the total variable costs for the first year following conversion were 122 and 131 dollars per acre for conservation-till (CT) and no-till (NT) wheat production, respectively.

Wheat breakeven price to cover these variable costs would be $2.50 and $2.76/bu at a yield goal of 35 bu/A for CT and NT, respectively. Potential income for grazing the wheat forage was not included and would reduce the total variable costs.

7. Outreach activities in 1995-1997 included field days at the study sites, producer metings, and technical conferences. The Duke tour was held on April 4, 1996 and the Forgan tour on April 11, 1996 to highlight crop growth under drought conditions and last year's research results.

Field days were held at Duke, OK on April 11 and at Forgan, OK on April 17, 1997. These were the final tours to be organized at the study sites and attracted nearly 100 attendees from Oklahoma and Texas.

The study results were focused on Old World bluestem grass management and wheat production options. The CRP study results were also presented at SARE Sustainable Agriculture Field Day at Tyrone, OK on August 20, 1997. The event attracted 250 producers and agricultural industry and agency personnel.

A team of extension specialists from Colorado, Kansas, New Mexico, Oklahoma, and Texas conducted a series of day-long producer meetings to update CRP contract holders on proposed regulations and future land uses based on economic decisions from Sep 30 to October 10, 1996.

A national technical CRP conference was organized in Amarillo, TX to elaborate on research results and post-contract management options on October 22-23, 1996. The program targeted the message to NRCS and ES personnel in the Central and Southern Great Plains. In the final year of the project, a major effort was focused on the technology transfer and extension of the R&D results to producers, action agency personnel, and the general public.

Two major conferences were organized and held in conjunction with the All Oklahoma Chapter of the Soil and Water Conservation Society. The conferences titled "The Future of CRP in Oklahoma-Alternatives and Planning Options" were held in Altus and Woodward, OK on February 10-11, 1997. Over 200 producers, agency personnel, bankers, and businessmen attended.

Other outreach efforts were made to prepare publications and news articles for the local and regional farm press. Information from our studies was a major component of a 4-page insert in the Conservation Technology Information Center *Partners* newsletter. The insert "CRP: Converting to Cropland" offered practical assistance to growers who were planning to farm their CRP land in various region of the country. Two Production Technology information sheets also were prepared on the conversion of CRP to winter wheat production and livestock production on former CRP lands.

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LS94-60
LS95-60.1
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Animal Waste, Winter Cover Crops and Biological Antagonists for Sustained Management of Nematodes on Cotton

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Plant-parasitic nematodes are limiting factors in cotton and other crop-production systems in the southern United States. These parasites restrict root growth and development, resulting in a general stunting of the plant. Poor root development prevents the plant from adequately interfacing with the soil for mineral nutrition and moisture. In addition to losses in cotton yield, the inability of the plant to utilize available nutrients and moisture can result in these nutrients and/or pesticides moving into ground or surface waters and thus becoming pollutants.

Demands for poultry and pork have resulted in rapid expansion of these animal husbandry operations in the southeast, and North Carolina in particular. Modern techniques in animal production result in the accumulation of large quantities of animal waste materials in small areas in rural communities. These animal-waste products are of major concern as sources of surface and ground-water pollution. Poultry litter contains relatively high levels of nitrogen, phosphorus, and potassium. Phosphorus and nitrogen are the most important components in pollution of streams and rivers. The use of high-nutrient manures rather than chemical fertilizers is an environmentally sound method of supplying necessary nutrients to cotton while disposing of this waste product. The ammonia in animal wastes, such as poultry litter, generally acts like slow-release fertilizers and can thus inhibit nematodes while supplying the plant with nitrogen in a safe manner. Another benefit of these organic type of fertilizers is that they increase beneficial microbial activity in soils which may aid in achieving a healthier, better balanced soil environment.

A common practice in southern row-crop agriculture is the sowing of a winter cover crop to prevent soil erosion. A winter rye crop in particular is beneficial in that it suppresses the population levels of many parasitic nematodes. The influence of other winter cover crops, such as vetch, canola, and other small grains on various plant-parasitic nematodes is poorly understood. The use of winter crops also is valuable in protecting the environment since they can scavenge nutrients left from the previous crop, prevent these nutrients from moving off site, improve soil tilth, and are an important component in conservation tillage.

Addition of animal waste products to the soil and the use of winter cover crops that are commonly grown to prevent soil erosion are generally beneficial because they increase the organic matter content of the soil.

Increasing the level of organic material in these soils improves their nutrient- and moisture-retention properties that favors the plant. Enhanced microbial activity, a result of the application of animal waste products and/or winter cover crops, can provide for an environment where antagonists of plant-parasitic nematodes, especially certain bacteria and fungi, can aid in suppressing these pests.

All of the aforementioned factors serve to enhance sustainability of agricultural production by providing for an improved agroecosystem. Potential reductions in costly inputs used by farmers can limit their reliance on petroleum based products for pest control and/or chemical fertilizer.

Objectives

1.) Evaluate the effects of the rate of poultry manure and litter and municipal-waste compost singly and in combination with winter-cover crops and selected nematode antagonists for control of plant parasitic nematodes on cotton.

2.) Determine the potential advantages of organic sources of nitrogen versus standard fertilizers on nitrogen use efficiency and potential environmental impacts.

3.) Incorporate findings into a sustainable cotton- and associated crop-production systems through a series of farmer-managed demonstration tests, tours, cotton production meetings and extension publications.

Approach

A combination of greenhouse, microplot, and field research plots were used to evaluate a winter rye cover crop with or without poultry litter and fungi for management of root-knot, sting, Columbia lance, stubby-root and reniform nematodes in cotton. All experiments were replicated to permit statistical analysis of the results. Eigh-

Project duration

3 years

Budget:

SARE	$ 143,412
ACE Matching	$36,949

teen field research experiments, fifteen in growers' fields and three on experiment stations, were used as field laboratories. The field plots also served an educational function in that they were featured in research tours and the 1997 North Carolina Cotton Field Day. Greenhouse and small plot tests were conducted in order to more precisely quantify the effects of selected nematode antagonists and green manure crops on these biological systems. This information has been and will continue to be disseminated to extension personnel, farmers and the general public.

Over 4000 soil samples were collected over three years to measure the impact of various treatments on communities of plant-parasitic nematodes. Nutrient levels of both soil from test sites as well as poultry litter were processed to assess the effects of these variables on the agroecosystems studied. Other measurements included cotton yield, numbers of nonparasitic potentially beneficial nematodes at one site, activity of biocontrol agents, and assessments of the cover crops.

Results

Field experiments have clearly demonstrated the benefits of application of poultry litter for management of plant-parasitic nematodes in cotton. Poultry litter has been highly efficacious in suppressing population densities of root-knot, Columbia lance, stubby-root, sting, and lesion nematodes in field soils and in other experimental systems. The inclusion of fungi and bacteria that parasitize these nematodes was only marginally effective in suppressing numbers of these plant-pathogens. A rye cover crop was effective in suppressing Columbia lance nematode in one field experiment, especially when incorporated in late spring or left on the soil surface in a no-till system. Incorporation of a rye cover crop tended to suppress other plant-parasitic nematodes such as root-knot, reniform and stubby root nematodes in greenhouse and microplot tests.

The 1997 results with rye, and other small grains, however, showed that some root-knot nematode populations, including race 4 of *M. incognita*, can reproduce on certain small grains. An extensive study focused on the identification and quantification of various organic acids formed during the decomposition of rye. Formic, acetic, propionic, butyric and valeric acids in soil solutions were monitored. Acetic and formic acids were detected by means of ion exclusion chromatography, primarily in the first 24 hours and at concentrations less than 20 /L. Although low molecular weight organic acids may be involved in the control of nematodes when rye is incorporated into soil, they singularly do not appear to be the primary mode of action.

Impact of results

Cotton growers in the southern region are highly innovative and receptive to implementing new and or developing technologies. The application of animal manures is especially attractive since it can reduce the need for expensive commercial fertilizers. Similarly, many farmers are utilizing cover crops, and this practice will be adopted with increasing frequency as they learn that a cover crop can alleviate stress on cotton due to nematode problems. The use of cover crops to improve overall nematode management is especially appropriate, since interest in conservation tillage is increasing. Cover crops cannot only contribute to nematode management, but may aid in preventing off-site movement of nutrients and minimize inputs of soil-applied herbicides. This project thus serves to illustrate to growers the benefits of sustainable approaches to cotton production.

Potential contribution

The use of poultry litter to manage nematode pests of cotton and promote soil health provides a method of biorational pest control. This practice can also reduce the rates of application of chemical pesticides and fertilizers. Thus, the proper selection and management of winter cover crops and animal waste can enhance pest management programs, scavenge surplus nutrients that would otherwise move into ground and surface waters, improve soil health, enhance soil moisture retention in porous soils, and also prevent erosion of top soils. All of the aforementioned factors can enhance sustainability of agricultural production by providing for a better and healthier agroecosystem. Potential reductions in costly inputs used by farmers can reduce their reliance on petroleum based products for pest control and or energy intensive fertilizer products. Reduced reliance on these products also serves to protect water and air quality, thus improving the environment.

Plans for remainder of project (Project extended into 1998):

Limited field experiments will continue to quantify the effects of litter application on plant-parasitic nematodes and cotton production. Additional emphasis will be placed on evaluating different cover crops and additional nematode-biocontrol agents for enhancing nematode control. Further research will involve the characterization of potentially beneficial soil microflora and fauna associated with the repeated application of animal wastes and use of a green manure cover crop. More efforts also will be devoted to outreach and extension efforts to disseminate this information.

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Integrating Sustainable Forestry into the Whole Farm Management of Minority and Limited Resource Landowners in Two Regions of Arkansas

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Traditionally, forestry extension has not been as effective as agricultural extension in disseminating information to landowners. Small landowners, or farmers with small woodlands, tend to be unaware of the value and methods to sustainably manage and harvest their timber and non-timber forest products.

An innovative effort between Winrock International, The Nature Conservancy, Ozark Foothills Resource Conservation and Development Council, and the Arkansas Land and Farm Development Council (ALFDC) has been educating non-industrial forest owners of the value of their timber to emphasize the need to seek professional advice before cutting trees. The working hypothesis for this project is if landowners realize their trees have increased in value over time, they will be less likely to clear cut their forests, will sustainably manage their forests, and will be more likely to plant trees as an investment.

The collaborative partners have worked with government and nongovernmental agencies, private foresters, and landowners to increase awareness of the value of hardwood timber land. Two areas of Arkansas have been the focus: the Mississippi Delta Region and the Ozark Foothills. Both regions are rural and have limited economic opportunities. Poverty is prevalent and individuals have the potential to make money from the sale of their timber.

This project follows an -action research- model which monitors the process as well as the results. Since all social interventions are experiments, understanding the success or failure of approaches can be as important as understanding the impact. If a participatory approach succeeds in the Delta, then a similar project can be replicated in other areas. In addition, by constant monitoring and evaluation, the approach can be changed or adaptively managed, to achieve the desired results.

The project is testing the two assumptions:

1. Educating landowners about management and harvesting options will

increase their income and encourage sustainable management and;

2. Participatory approaches are the most effective way to educate landowners in the Delta and the Foothill ecosystems.

Winrock and its partners see the process and the results of this project as important components in understanding social, economic, and ecological changes in both regions.

Objectives

1.) Test context-appropriate participatory strategies to promote sustainable farm forestry for the Delta and Ozarks.

2.) Compare context and strategies to identify factors that influence effectiveness.

3.) Engage limited resource and minority farmers, community based organizations, technical advisors and policy makers in a dialogue about how best to effectively promote sustainable management of hardwoods on the farm.

4.) Evaluate existing policies and programs, and recommend improved policies and programs.

Approach

The methods used to achieve the objectives are:

· Develop and distribute useful extension materials;

· Encourage interagency cooperation by establishing a working group and interdisciplinary activities;

· Promote sustainable hardwood forest management practices through workshops;

· Establish two forest landowner associations in the Ozark Foothills region;

· Assess and demonstrate land use options; and

· Analyze the approaches and share results through a case study and issues paper.

Impact of this project will be evaluated by measuring the following indicators:

· Number and/or distribution of useful extension materials; Economic analysis of land-use options.

· Number of interagency working group meetings and collaborative efforts;

· Number of workshops convened and number of participants;

· Number landowner requests for assistance in managing timber;

· Number of landowner associations, mem-

Project duration
3 years

Budget:

SARE	$246,710
ACE Matching	$159,086

bers, and types of activities;

· Number of site assessments conducted for private landowners;

· Development of forest demonstration site(s) and number of people who have toured the site(s);

Results

Primary results achieved by the end of 1997 include:

· Five Top Dollar For Your Timber landowner workshops were held attracting more than 427 participants;

· *Top Dollar For Your Timber*, an instructional video, was produced and will be distributed to 200 extension agents throughout the state.

· A second Fact Sheet entitled *Tree$ for Wildlife*, discussing how to manage forest lands for wildlife was created and distributed.

· An analysis examining the economic return from growing hardwood forests on marginal lands in the Delta region was published.

· Three coordination meetings for representatives from collaborating agencies were held;

· More than 100 requests for information on harvesting and timber management were received;

· The Ozark Woodland Owners Association was formed and conducted four meetings. Two newsletters were produced as was a woodland management video.

· Nine site assessments/evaluations were conducted by private consulting foresters;

·More than 200 people visited ALFDC's demonstration forest.

Impact of results

These activities have had an impact on government and nongovernmental agencies, private foresters, landowners, and the environment. The Arkansas Forestry Commission, the Natural Resource Conservation Service (NRCS), the Arkansas Forestry Association, and the Arkansas Cooperative Extension Service have incorporated the Top Dollar For Your Timber workshop in their office activities. Collectively, these agencies have received more than 100 phone calls from people who are interested in selling their timber and heard about the workshop but were not able to attend. The NRCS and Cooperative Extension are referring clients to professional foresters and/or to the Forestry Commission for information about management plans. An NRCS office outside Arkansas has requested information about the Top Dollar For Your Timber workshop so it can implement the workshop in that region.

Landowners who have hired private consultants have reaped economic benefits. One consultant has worked for seven landowners who chose to get a professional appraisal based on recommendations of the workshop.

These landowners have or will increase their income by an average of 25 percent, over earlier timber estimates. With the exception of one landowner, all will be cutting less timber than they would have based on their initial estimate.

In sum, landowners have become more aware of the value of their timber and have demonstrated an interest in managing their woodlands for the long-term.

Potential contributions

The contributions of this project for producers or consumers are not easy to measure. They may include increased sustainable forest management practices which will have both economic and environmental benefits. Landowners already have benefited from a greater economic return from their timber. Secondary wood processors will have access to high-quality, locally grown timber in the future. Landowners who sought professional woodland management advice have, in general, cut less timber than they would have without consultation. This results in unquantified environmental benefits to society including carbon sequestering, providing wildlife habitat, and reducing soil erosion.

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Intercropping Small Grains and Lupin for Sustainable On-Farm Utilization

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Objectives

Agricultural enterprises depend on innovation to stay competitive and as the old saying goes 'necessity is the mother of invention'. Feed costs are the single largest cost item for dairy operations. Due to constant disease and pest pressure it is not economical to produce alfalfa in a large portion of the southern United States.

Alfalfa haylage and hay together with high quality corn silage are the basis of total mixed dairy rations in traditional dairy states such as Wisconsin, Michigan, and New York. We are developing binary mixtures of small grain (wheat, oat) and the large-seeded winter-annual lupin to address the need for a high quality base ration for dairy operations in the southern United States.

Results

We have demonstrated over the last three years that it is possible to produce 8 - 10 tons of pure lupin per acre silage (65% moisture)compared to 9-13 t/acre for mixed stands and 9-11 t/acre for pure wheat. Harvested at the right time - early bloom, this silage has very high quality.

Relative Feed Value (RFV) is often used as a measure to compare the quality of forage; full bloom alfalfa is assigned a value of 100. The relative feed value of the lupin leaf component is > 230 and lupin stem are approximately 130. The resulting total silage has a RFV exceeding 135 which is in the range found for corn silage made from corn with well developed ears.

Growing a small grain with the lupin rather than lupin in monoculture produces some desirable effects, among them enhanced survival of lupin seedling. Our research also shows that careful seedbed preparation is a must for successful lupin cultivation. Fall-seeded lupin is a very attractive deer browse in wildlife plo ts. Deer tended to consume lupin preferentially over all other forages offered to them. This fall, we have the first commercial lupin acreage in Alabama for seed production.

Fifteen acres were established in Central Alabama. Seed from this production will be used either in hog rations or sold to farmers to be used as a cover crop preceding cotton.

Project duration
3 years

Budget:

SARE	$143,151
ACE Matching	$164,759

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Regional Center for Sustainable Dairy Farming

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Cooperators continued on next page

Project duration
4 years

Budget:
SARE $180,497
ACE
Matching $127,92

Objectives

1.) Compare and evaluate profitability of two integrated systems of dairy production; one based on intensively managed pasture crops, the other based on row crops and conventional confinement housing and feeding.

2.) Evaluate the impact of the pasture-based system on animal performance and health compared to conventional confinement system.

3.) Examine the feasibility of seasonal milk production within pasture-based and conventional confinement systems.

4.) Evaluate nonpoint source water quality and soil conservation impacts on land uses under the pasture-based and row-crop forage systems.

5.) Demonstrate and disseminate the results among farmers, extension personnel, service industry personnel, students, and others.

The Regional Center for Sustainable Dairy Farming was initiated with Southern Region SARE funding in 1994. Objectives included a comprehensive comparison of two integrated systems of dairy production; one based on intensively managed pasture crops, the other based on row crops and conventional confinement housing and feeding.

Approach

The comparison was organized to allow us to examine animal performance, health, seasonal reproduction, and nonpoint source water quality and soil conservation impacts of the two systems. Estimates of labor, equipment, and facility needs of similar systems of various sizes will be incorporated in the overall economic analysis when the initial phase of the project is completed in 1998. The project has also included a strong outreach component which allows for demonstrations and dissemination of preliminary results to farmers, extension personnel, service industry personnel, students, and others as the project has progressed.

The Dairy Educational Unit of NC State University's Lake Wheeler Road Field Laboratory is the primary location of the experimental portion of the project. In addition, the teaching herd at NC A&T State University and cooperating producers in the region (VA, NC, SC) have been resources for various demonstrations, pasture walks, field days and as advisors.

The experimental project is based on use of groups of Jersey and Holstein cows assigned at calving to either the pasture-based system or to the confinement-feeding system. When the project started in 1995, we used 24 Holstein cows and 12 Jersey cows in each replicate but since then we have used 18 Holsteins and 18 Jerseys in each treatment group replicate. A replicate consists of either 36 spring calving (Jan. - Mar.) Or 36 fall calving (Aug. - Oct.) Cows on pasture and a similar group housed and fed in confinement. We have now completed 3 spring-calving replicates and are now well into the third fall-calving replicate.

Cows are kept in respective systems through lactation but are grouped together in other areas during non-lactating periods. Healthy cows that rebreed are kept in the same treatment group for the following lactation.

Cows in the confinement system are housed in a free-stall barn with an outside bare exercise lot. Rations include a blend of corn silage and sometimes haylage with various grains and by-product feeds and fed as a total mixed ration. In contrast, cows in the pasture system are kept on pasture except for supplemental grain feeding and for milking.

Supplemental grains and by-products are fed in a covered feeding area before each milking. When pasture is limiting, additional supplemental grain and by-products are fed and/or hay or hay-crop silage is offered to meet requirements. Hay or round-bale silage is fed on pasture paddocks using a looped electric wire to keep the forage be being trampled and spoiled. In periods of extreme heat and humidity; pasture-based cows are allowed to stay in the covered feeding area for shade for an extra hour or two.

The pasture area is approximately 74 acres which is divided into 37 two-acre paddocks with several combinations of cool season and warm season grasses and legumes to allow for grazing throughout the year.

Most of the pastures include perennial species but some winter and summer annuals are used strategically. Each paddock includes a water source and is accessible from a 16' travel lane.

Data collected have included daily milk yields, weekly estimates of feed intakes, compositional analyzes of feeds and forages including

fresh pasture, routine recording of udder infections (mastitis) and other health problems, weights and body condition scores of cows twice a month, reproductive information, and monthly concentrations of fat, protein, and somatic cells (udder health) in milk. In addition, storm water runoff samples are collected from a 3-acre exercise lot and from drainage from about 22 acres of pasture area for concentrations of solids, phosphorus, and nitrogen in runoff. Multiple 24-hour cow watches have been conducted for the pasture group to get an estimate of the distribution of feces and urine on pastures and the proportion of nutrients deposited in feeding and milking areas in contrast to pasture areas.

Results

Preliminary results to date have shown tendencies for some factors to favor the confinement feeding system, and others to favor the pasture-based system. Milk production almost always is higher for confinement-fed cows and seasonal averages range from as low as about 3 pounds difference per cow per day to as much as 12 pounds difference per cow per day. This, of course, means reduced milk income per cow for cows in the pasture system as we have managed it. However, because overall feed cost are lower for cows using pasture, differences in milk income remaining after feed costs are subtracted are not as large. However, there still is a small advantage for confinement cows in most of the replicates when considering only milk income and feed costs. Jersey cows milk less than Holsteins and milk income over feed costs is also lower for Jersey cows in both systems.

Measures of animal health and milk quality are also important in evaluating systems of production. Our preliminary work has documented that the overall incidence of udder infections (mastitis) is nearly twice as high for cows fed in confinement compared to cows on pastures (42.2% vs. 22.8%). Subclinical udder health can also be an issue but somatic cell count scores are similar for pasture and confinement cows. There are highly significant breed differences in incidence of mastitis with Holsteins at 41.1% vs. Jerseys at 23.9%. Adjustments for udder health and milk loss will be done at the completion of the project but certainly will reduce differences in net production income for Holsteins over Jerseys and for the confinement system over grazing.

Although it was expected that the feeding systems might affect reproduction, no differences due to treatment have been observed although the overall pregnancy rate in a 75-day breeding period is numerically in favor of cows on pasture (74.4% vs. 68.8%). However, there are obvious breeding efficiency advantages for Jersey cows over Holsteins in first service conception rate, conception to all services, proportion of cows inseminated and overall pregnancy rate.

Overall 75-day pregnancy rate is a function of the other measures and was 84.2% for Jerseys compared to only 58.9% for Holsteins.

Other indications of animal well being include incidences of lameness, metabolic diseases, and death. These data have not been fully summarized but death loss appears to be of greater concern among cows in confinement than for those on pasture. Other disease and health problems have not been remarkable between groups other than a few cows with lamenessin 1995 when sharp gravel was present on travel lanes for pasture cows.

Body weight changes and body condition scores have shown that cows inthe pasture system do not carry as much weight and condition through the lactation. This may be due to the increased exercise from walking to and from pastures and during grazing.

A very important issue in comparing the two systems is the deposition, collection, and recycling of nutrients. All of the feces and urine of the confinement cows has to be handled or processed in some way whether from the feeding, housing, and milking areas or from the bare exercise lot. This requires special needs for handling, storage, and redistribution of nutrients to cropland or other uses. In contrast, our 24-hour cow watches have shown that 87% of urine events and 86% of manure events occur in or near paddocks where it is readily recycled for pasture use. This means that a pasture-based system has to design storage and handling facilities for only about 14% of manure plus milking facility wash water.

Nutrient runoff from the bare exercise lot has had quite high concentrations of total solids, suspended solids, total nitrogen, ammonia, total phosphorus, ortho phosphorus and chloride. Measures of carbon-oxygen demand and conductivity were also quite high for storm water runoff from that lot used by confinement cows (and other cows not on experiment). In contrast, these measures were significantly lower for runoff samples from pasture and during most storm events were acceptable levels for surface water. This indicates that the densely vegetated, rotationally grazed pasture is effectively retaining feces, urine, and soil on the field instead of washing away during storm events. Additional structures have been installed for runoff from the bare exercise lot to prevent nutrients and sediment from reaching the stream. Data on those methods will be available later.

In our environment, the pasture-based cows have lower housing and facility requirements and perhaps lower equipment needs. However, both confinement and pasture systems do have specific equipment needs that may vary depending on the size and scale of the farm. Estimates of labor requirements are being documented for the two systems. These factors will be considered in the final report and economic analysis.

Observations from the teaching herd at NCA&T State University have shown an estimated reduction in feed costs by at least 25% from 1995 before the grazing management program was initiated. They also report much less time scraping and handling manure because cows are on the pasture much more of the time. Body condition of cows has remained acceptable and overall health problems have been low. However, milk production and reproduction in the herd are still less than optimal.

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Wildlife Enhancement and Education as a Catalyst in the Widespread Implementation of Sustainable Agricultural Practices

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Project duration
4 years

Budget:

SARE	$98, 205
ACE	$75, 000
Matching	$202, 904

Objectives

This project explores the feasibility of incorporating critically needed wildlife habitat on a landscape scale, with water quality benefits, into production agriculture in eastern North Carolina and Virginia. Working with cooperating producers, including both traditional family farms and corporate farms, a team of wildlife ecologists, integrated pest management specialists, agronomists, and economists has been assembled to implement field border systems around crop fields in several agronomic regions. Field border systems consist of fringe areas of early successional, non-woody vegetation maintained around all the cropped fields on experimental farms. The total area of these systems for any farm unit approximates 5 percent of the cropped acres.

Approach

Project scientists and their graduate research assistants are utilizing Geographic Positioning Systems and Geographic Information Systems to map and analyze how crop yields, pest populations, wildlife populations, and water quality vary within and across study farms. The test farms are located in the Upper Coastal Plain of North Carolina and Virginia, and the Tidewater of North Carolina. Tidewater farms are dedicated to grain production on drained wetlands, with clearly delineated drainage ditches and canals, on which field border systems have been or will be established. Upper Coastal Plain farms in North Carolina produce grain crops, tobacco, cotton, and peanuts. The farms in Virginia incorporate grain production into dairy operations. In each agronomic region, control farms or farm units of comparable size and characteristics, but lacking field border systems, have been identified. Each experimental unit exceeds 1,000 acres, making this research truly a landscape scale experiment. This scale is necessary due to the mobility of wildlife within the agroecosystem, as well as the cumulative impacts of field practices on water quality.

Results

In this, the second full year of the work, we censused wildlife on experimental and control farms. The data are being analyzed for theses and technical papers.

Preliminary inspection of the data indicates that field borders in their second growing season may support more songbirds and quail than systems in their first year. Our protocols for Integrated Pest Management and water quality work have been established. Measurements in these areas began with the 1997 growing season. The economic implications of field border establishment are being investigated through field measurements of crop yields at crop field edges on farms with and without field borders.

Maintenance cost for field border systems is being evaluated by comparing mowing to herbicide treatment via the new *Weed Sweep* machine, adapted especially for this project. These data will be entered into agronomic models of crop production to generate net profitablilty estimates for farm units with and without field borders. Also, we are conducting an economic analysis of the demand for high quality bobwhite quail hunting to generate possible returns to the producer for establishing and maintaining field border systems.

Knowledge of this project has been spread by word of mouth through the agricultural community in eastern North Carolina and Virginia, which is likely the most convincing way to interest non-cooperating producers and public agency professionals in the region. This has been supplemented by articles in local newspapers and articles in state magazines. The work is well known among professional wildlife biologists in the southeastern United States for its innovative approach to establishing productive wildlife habitat on intensely farmed lands.

Impact of results

These early results indicate that this project will have significant implications for agricultural sustainability. It may be demonstrated here that establishment of critically needed wildlife habitat that also fulfills water quality objectives may be economically feasible.

Economic feasibility will depend upon consumer demand for high quality quail hunting, least cost establishment and maintenance of wildlife habitat, and availability of public support for water quality protection. The data from this study

should provide all the information needed for producers and public agency administrators to make well informed decisions on a farm by farm basis.

Plans for remainder of project (Extended to 1998)

Plans for the project include continuing to measure wildlife response to field border systems, water quality measurements, IPM measurements, and analysis of economic feasibility. Part of the project deals with understanding in detail the interests and reservations of producers to establishing field border systems.

In 1997, we conducted a series of personal interviews with producers to characterize their perspectives in each of the agronomic regions. We began to script and film our project video in 1997. Approval was attained from the NCSU Department of Agricultural Communications to use their facilities and staff to produce the video. In 1998, when the measurement data is in hand, we will summarize what was learned for reports, scientific publications, extension publications, producer meetings, and professional meetings, as well as for use by the press. We anticipate the high interest this work has generated to intensify when the data is available, and we plan to be ready to make best use of these opportunities.

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Pasture-Based Swine Production Systems for Limited-Resource Farms in the Mississippi Delta

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In the Mississippi Delta of Arkansas, agriculture is dominated by the intensive use of pesticides on large farms that produce cotton, rice and soybeans. However, there is growing awareness for alternative enterprises in the woodland, vegetable and livestock sectors that are adaptable to small farms. One of the major constraints to diversifying agriculture in the Delta is the existence of tradition bound farmers unable to make the transition into market driven ecologically sensitive livestock production systems.

This demonstration-education project will provide technical assistance to aid limited-resource farmers in adopting a pasture-based swine production system. The design requirements entail low capital inputs adaptable to farming situations that exist on small-scale farms located in the Mississippi Delta region.

Objectives:

1.) Evaluate various designs for pasture-based pig production and selection of design(s) adaptable to the Mississippi Delta region.

2.) Develop an effective training system to increase the number of limited-resource farmers with technical knowledge of pasture-based pig production.

3.) Provide training and technical assistance to limited-resource farmers to increase the adoption rate of pasture-based pig production in the Mississippi Delta region

4.) Assess the economic and social impact of pasture-based pig production in the Mississippi Delta region.

Two farmer cooperators in the project produce vegetable and row crops, while maintaining small swine herds. One does not own most of the land he farms, so he needs a hog production system that does not require permanent housing and other facilities. The other farmer operates small scale mixed livestock enterprises which include, poultry, beef cattle and swine.

The concept of pasture-based systems utilize low-cost portable housing and electric fencing. Most of the information available on pasture-based swine production is based on experiences of midwestern producers. The project will adapt many of these practices to conditions and situations that exist on limited-resource farms located in the Mississippi Delta.

Approach

Objective 1. One design of pasture-based swine production is being used at the demonstration farm that is owned and operated by the ALFDC in Fargo, Arkansas. This system is a multiple paddock system that uses 12.5 gauge, high tensile electric fencing. The pasture layout includes 12 paddocks (average size of 0.4 acres), six paddocks on each side of an access lane. Distance that hogs must be moved remains manageable. Overall, we have found this design very acceptable.

At the ALFDC demonstration farm, 13 gilts were bred by two Duroc boars. One group of six farrowed in May 1997 and the second roup of seven farrowed in late July 1997. The first group farrowed a total of 60 live pigs and weaned an average of eight pigs per sow. These pigs were marketed as feeder pigs (average weight = 48.7 lbs) and sold (average price = 99 cents/lb.) through Missouri Farmers Association (MFA) video-marketing program. The second group farrowed 68 live pigs and weaned an average of seven pigs per sow. Three pigs were sold to a local farmer and the remaining (47) pigs (average weight = 75 lbs.) were sold (average price = 74.25 cents/lb.) through MFA. The MFA market was chosen because of its video marketing capabilities that offers top dollar for farmers participating in their programs. Other markets are being explored that will allow farmers options for marketing their hogs.

In 1997, sows were farrowed using two types of hut designs. One type is a Quonset-style that is wooden with a sheet-metal fiberglass-insulated roof. The second design constructed with plywood is a modified A frame design with no insulation. All new materials were used to construct these huts with each costing approximately $150. These two huts were chosen based on research reports that have shown that sows farrowing in these designs crushed less of their pigs as compared with sows farrowing in other designs. Both of these huts have worked well at the ALFDC farm and can be built with hand tools common to most farms plans. Materials lists for both of these huts can be acquired by contacting the ALFDC.

In 1997, the hogs grazed a combination of

Project duration
3 years

Budget:
SARE $274, 412
ACE
Matching $68,852

forage crops which included, annual ryegrass, crabgrass, tall fescue, sorghum-Sudan grass, and purple-hull peas. Forages comprised about 40 to 60 percent of the sow gestation diets which resulted in significant feed cost savings. For example, we estimated a monthly savings in feed cost during early gestation to be approximately $7.75 per sow when grazed on annual ryegrass. The amount of grain and protein feeds offered to sows were adjusted based on forage quality, forage availability, body condition, and stage of gestation.

General Management A 3.5-acre area was fenced and cross-fenced using two electric wires (12.5 gauge, high tensile). The pasture layout was designed to include 10 paddocks with an average of .3 acres. There are five paddocks on each side of an access lane. Multiple paddocks allow the movement of hogs to different paddocks using the alley. Hogs are moved to different paddocks for three main reasons: (1) to accommodate different stages of the production cycle (breeding, gestation, farrowing, etc.); (2) to allow previously occupied paddocks to rest and recover from the effects of animal pressure such as trampling and rooting; and (3) to limit graze hogs on high nutritive value crops.

The water source is an 8-inch, irrigation well that has been filled with a flow restriction mechanism that allows a storage tank to be filled with a two-inch line. The water from the tank gravity feeds through a .75-inch, flexible hose (above ground) to individual 55-gallon, plastic barrels equipped with automatic water and float valves. The barrels rest on wooden pallets and can be easily transferred to other paddocks when necessary.

Feeding Management At this time, hogs are being fed a commercial feed using wooden V-shaped feeders. A set of working pens are presently being constructed in one of the smaller paddocks. Plans are being developed to utilize more "home grown" crops as feed ingredients. Some of these crops will include corn, peas, and sweet potatoes in addition to forages.

Pasture Management Some of the paddocks have been improved and contain stands of tall fescue and animal ryegrass. The ryegrass will be grazed when soil conditions will support the animals. Other forage crops are being evaluated on site. Fifteen species and species mixtures are being evaluated in a randomized block design to determine yield potential for the soil type and climatic conditions common to this region.

Objectives 2 and 3:

Information sheets were distributed during outreach events which included field days and individual tours. We estimate that approximately 300 people have toured and received information on pasture-based swine production.

In 1997, two farmers were provided with resources to setup a pasture-based system on their farms. These farmers will serve as paraprofessional farmers and will assist in the training of other farmers interested in pasture-based swine management. When these farms become operational, there will be three sites that can be used and will enhance our community-based system for informational transfer.

Impact of Results

The project was designed primarily to provide technical assistance to limited-resource farmers on low-input, sustainable swine management systems. These systems feature low-investment costs, portability, and grazing to lower feed cost, therefore, they are appropriate for limited-resource farmers and beginning farmers who may have to operate on rented land. The adoption of a pasture-based swine management system by limited-resource farmers in the Mississippi Delta should provide for diversification and integration of crop and livestock production and year round employment.

The ALFDC demonstration site is a working model of a pasture-based system that allows farmers to see first hand how these systems work. Furthermore, experiences gained from this site can be passed on to farmers possibly preventing them from making costly mistakes. Furthermore, this project has allowed an animal scientist at Arkansas State University to have a major role in filling a void in the Delta by providing technical assistance to farmers on livestock management.

Plans for remainder of project

Plans for the remainder of the project are to expand outreach through training, demonstration and dissemination activities. A project advisory committee will be formed consisting of farmers and representatives from participating agencies. The committee's function will be to plan and schedule training events, to meet quarterly to assess the progress of the project, to make decisions that will adjust project activities based on intended or unintended developments, and to oversee all project operations. Also, we will select two other demonstration sites at privately-owned farms in Arkansas.

SARE
Sustainable Agriculture Research and Education
Southern Region

LS95-68
Annual Report
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Using Farm Family Case Studies to Teach Sustainable Agriculture

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Cooperators continued on next page

Project duration
3 years

Budget:
SARE $146, 630
ACE
Matching $137,090

Without effective methods to educate producers about advancements in sustainable agriculture production, the development of new techniques would have academic, but very little practical value. The goal is widespread adoption of proven sustainable technologies on farms worldwide. The challenge is to be as effectual with our educational outreach as we are productive in research and development.

The purpose of this project is to use a creative multi-media approach to extend the experiences and results of an on-farm sustainable farming demonstration project and to encourage widespread support and adoption of sustainable agriculture practices. Educational videos and written materials featuring a variety of farm types in Kentucky, Mississippi, and Tennessee are being developed to educate producers, community leaders, and school children throughout the United States about the value of sustainable agriculture and the challenges and benefits in applying sustainable technologies to the farm.

Objectives

1.) Develop case studies of farm families that have employed sustainable agricultural production practices on their farms. Prepare for a farm audience a five-part video series that documents the successes and challenges of these families in adopting sustainable agriculture practices and the economic and environmental impacts that resulted.

2.) Prepare a facilitator's guide to accompany the case study videos that includes lesson plans, discussion questions, farm overviews, fact sheets, and worksheets that provide more detail on the concepts in sustainable agriculture that are introduced in the farm family case study videos .

3.) Prepare for a non-farm audience a 15-minute video that emphasizes the potential benefits of sustainable agriculture for the community and encourages community leaders to support the adoption of sustainable agriculture techniques on local farms.

4.) Develop up to five condensed versions of the case farm videos for public school teachers to pilot-test in their classrooms and to complement the Ag in the Classroom curriculum. Construct lesson plans to accompany the video(s) and facilitate its use by teachers.

5.) Distribute one copy of all materials to each 1862 and 1890 land grant University.

6.) Present the concepts of sustainable agriculture to 500 farmers in Kentucky, Mississippi, and Tennessee by conducting 25 educational meetings and presentations. Educate 300 Extension agents and other agriculture professionals about sustainable agriculture through in-service training.

Approach

A predecessor of this project was a five-year whole-farm demonstration project called Agri-21 Farming Systems (Agri-21). Agri-21 was designed to help farmers move towards a more sustainable operation. Following an intensive evaluation of selected farms, cooperating Agri-21 producers and project participants developed whole-farm plans detailing an approach to more profitable, environmentally friendly operations. Various sustainable technologies have since been adopted on the participating farms. Throughout the Agri-21 program, comprehensive sets of economic and environmental data were gathered and analyzed. These data were used in the development of the current project.

The five farm family case study videos developed for this project highlight sustainable agriculture techniques adopted on selected Agri-21 farms. In total, ten different themes are featured. The majority of information in the videos is presented by the case study families. Each family discusses and/or demonstrates how the adoption of sustainable techniques helped them meet their goals pertaining to farm profitability, environmental concerns, farm leadership in local communities, and farm family quality of life

A written facilitator's guide will accompany the videos. The guide, which will be used primarily by agricultural extension educators, provides an overview of the case study videos, suggests methods in which the videos can be used to achieve a set of educational objectives, provides suggestions for stimulating group discussions, and includes fact sheets and worksheets that provide more detailed information on the topics introduced in the videos. The written materials include enough information that educators will need little or no training prior to adopting the materials for educational seminars.

Draft versions of video and written materials

were reviewed by the project steering committee, participating farm families, and a panel of over 40 reviewers of various disciplines. The reviewers provided feedback on the quality of the material presented and the value and appropriateness of the information presented. The feedback directed final revisions of the materials.

The case study materials will be used by the three states cooperating in the project to present concepts of sustainable agriculture to at least 250 individuals over a two-year period. In addition, a copy of the completed materials will be distributed nation-wide to each 1862 and 1890 Land Grant University.

The footage obtained from the five case study videos was used to create a sixth video for a non-farm audience. The footage was re-cut and supplemented with b-roll from various sources. This video will be shown to community leaders in an effort to foster a greater awareness of the benefits of sustainable agriculture and encourage increased adoption rates of sustainable agriculture on local farms.

A youth project steering committee has been appointed to develop a shorter version of the materials for use in teaching youth. This steering committee includes teachers, Extension youth educators, and communications specialists. The charge of this steering committee will be to guide the adaptation of the case study videos for use with youth audiences and to assist in the development of lesson plans or projects to accompany the youth video.

Measurements

An evaluation form will be distributed to audience members after a seminar using the Farm Family Case Study materials. Farm audiences will be asked to hypothesize changes they might make to improve their sustainability. If time and resources permit, a follow-up evaluation of audience members will be conducted six months later to determine what changes they have implemented.

Results

The five case study videos are complete. Each case study video is approximately 15-minutes in length, documentary-style, and contains all the elements of a standard long-form educational video including testimonials, professional narration, field footage, stock footage from multiple sources, titles, graphics, composites, illustrations, animation, supers, multiple music tracks, and credits.

One video from the five-part series was pilot-tested during five Integrated Marketing and Management In-Service agent training seminars conducted in Tennessee from September to November, 1997. Written and verbal evaluations were consistently favorable.

The rough cut of the "General Audience" video is complete and has undergone the review process. Final edit is expected to occur within a month of this writing. The "General Audience" video will contain the same elements as the case study videos.

The research and writing of the facilitator's guide is complete. The materials have been reviewed by the steering committee, participating farm families, and the panel of reviewers. Currently, the facilitator's guide is undergoing final formatting and proofing.

Impact of Results

The major impact expected from the completion of this project is increased awareness, support, and adoption rates of sustainable agriculture production by both farm and non-farm audiences, including producers, extension agents and specialists, policy makers, teachers, and school children.

Potential contribution

Producers will benefit from the lessons learned by others who have employed sustainable agriculture practices on their farms. As a result, producers will make more informed decisions when adopting sustainable technologies on their own farms. More informed decisions could potentially yield increased farm profitability, decreased negative environmental impacts on and off the farm, greater efficiency in farm management, an edge in competitiveness, and an enriched quality of life for the farm family.

Consumers, in turn, will benefit by farmers' increased adoption of sustainable technologies. The food and fiber supply will continue to be safe, reliable, affordable, and fresh. Consumers will continue to enjoy clean air and water, a more stable economy that includes turnover of farm resources, enhanced quality of life, and better health. The community will also continue to benefit from farm family involvement and leadership in community activities.

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SARE
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Southern Region

LS95-69
Annual Report
December 1997

Managing Soil Phosphorus Accumulation from Poultry Litter Application Through Vegetable/Legume Rotations

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Cooperators continued on next page

Project duration

3 years

Budget:

SARE	$135,000
ACE	
Matching	$90,813

Applying poultry litter at rates sufficient to meet crop needs for N results in P accumulation that can lead to non-point source pollution of surface waters. Legumes are able to use significant amounts of P and K. An advantage of using legumes for removing excess P is that no additional N fertilizer has to be applied since legumes can obtain N from the atmosphere through N_2 fixation. Including warm- and cool-season legumes for hay or silage may be one way to reduce excess soil P.

Objectives

1.) Investigate the use of warm- and cool-season legumes and legume-grass mixes in rotational cropping systems to remove excess P supplied by poultry litter;

2.) Evaluate cool-season legumes for P uptake efficiency following litter application rates on spring vegetables

3.) Monitor P, and K accumulation, N leaching, and P runoff in a vegetable-forage legume rotation system

4.) Demonstrate use of annual legumes in cropping systems, utilizing poultry litter as a nutrient source, on grower-owned land under grower conditions.

Approach

Factored experiments were established at the Texas A&M University Research and Extension Center at Overton (Spring 1995) and Oklahoma State University Vegetable Research Station at Bixby (Fall 1995). Crop yield and nutrient uptake was determined along with accumulation of P. Surface runoff of P was monitored by use of flume catch basins. Results will identify strategies that reduce non-point source pollution and soil imbalances and offer an opportunity for adoption of improved, environmentally sound management practices.

The litter rates applied for all objectives were based on soil test nitrogen (N) requirement of the vegetable crop and percent N content of the litter. This was considered the 1X rate. Litter was applied to the vegetable crop only. Treatments were incorporated immediately after application by power tilling.

Results

Treatments in objective 1 consisted of cropping system (spring legume-fall vegetable) with litter rate (0, 1X, 2X, 4X, and commercial blend). The vegetable crops were: watermelons - spring 1995; broccoli - fall 1995; tomato - spring 1996; collards - fall 1996; squash - spring 1997; turnips - fall 1997. The spring legume crop was Iron and Clay cowpeas and the fall crop was crimson clover. Data were collected on yield, plant P concentration and P uptake. Soil samples to determine P concentration were obtained at depths of 0-15, 15-30, and 30-45cm (0-6, 6-12, and 12-18 in).

Applying litter at the recommended rate from soil testing maintained P levels in the surface 0-15 cm (0-6 in) depth at approximately 60 $mg \cdot kg^{-1}$ (ppm) during the study period covering 5 seasons. Leaching of P through the soil profile was also reduced. Increasing litter rate 2 times (2X) to 4 times (4X) the recommended, increased soil concentration. The least amount of P accumulation was from commercial blend fertilizer.

Utilizing a cropping system approach to reducing soil P accumulation and leaching proved to be very effective. A system of planting a spring vegetable and following with a fall cover of crimson clover reduced soil P in the surface 0-15 cm (0-6 in) of soil dramatically. The greatest accumulation and leaching was when litter was applied to a vegetable crop continuously.

In objective 2, litter was applied in the spring each year to the vegetable crop only. The rates were 0, 1X, 2X, 4X, and commercial blend. The crops were: watermelon - 1995; sweet corn - 1996; tomato - 1997. In Fall 1995, cool-season legumes consisting of crimson clover, berseem clover, hairy vetch, and red clover were seeded. Due to loss of stand of berseem clover because of freezing weather, a crimson clover-ryegrass mix was substituted in the 1996 planting. Data were obtained on yield, plant P concentration, P uptake and soil P concentration at depths previously mentioned.

In both 1995 and 1996 hairy vetch produced the highest dry matter yield. In 1996 a mix of crimson clover and ryegrass produced yields significantly equal to that of hairy vetch. Hairy vetch was superior in P uptake both years.

When litter was applied at the recommended

(1X) or 2 times (2X) the recommended rate, accumulation and leaching of P was less over time when compared to the 4 times (4X) rate. The least amount of accumulation was from commercial blend application.

Hairy vetch reduced accumulation and leaching more than the other species. A reduction was also demonstrated by a mix of crimson clover and ryegrass but not as great. The most accumulation was from red clover.

In objective 3, cropping systems of spring vegetable-fall legume, spring legume-fall vegetable and spring vegetable-fall fallow were studied. Fertility treatments consisted of 0, 1X, 4X and commercial blend. The vegetable crops were: turnip - fall 1995; sweet corn - spring 1996; turnip - fall 1996; watermelon - spring 1997. The cover crops were crimson clover and Iron and Clay cowpeas. Data were obtained on yield, plant P concentration, P uptake, and soil P concentration at depths previously mentioned.

Objective 4 was implemented in spring 1996 with the establishment of two demonstration plots: one was on the George Millard farm in Nacogdoches County and the other on the Rollie Skinner farm in Cherokee County. Soil samples were obtained before plot establishment to determine residual P. On the George Millard farm, litter at the rate of 8.9 $kg \cdot ha^{-1}$ (4 tons/A) was applied and tomatoes planted. On the Rollie Skinner farm, litter furnished by George Millard was broadcast applied on one-half of a 0.25 acre plot at 8.9$kg \cdot ha^{-1}$ (4 tons/A) and commercial blend of 129N-34.2P-37.2K $kg \cdot ha^{-1}$ (115N-30.5P-33.2K lbs/A) was applied to the other half. Sweet corn was planted on the whole plot. In fall 1996 hairy vetch was seeded.

Tomato plants grown on plots with poultry produced an average of 12.7 kg/plant (28 lbs) of fruit. Yield was not obtained for sweet corn but was reported that more ears were harvested from the poultry litter plots than the commercial fertilizer plots.

Hairy vetch was not seeded on the Millard farm. The plot area that received poultry litter on the Skinner farm produced 1,520 $kg \cdot ha^{-1}$ (1,356 lbs/A) more vetch than that receiving commercial fertilizer. Due to demonstrations of litter use in vegetable production programs, grower interest and awareness of the nutrient value of poultry litter has been increased. Continued demonstrations will help to show growers how a cropping system approach can be used to alleviate problems associated with litter use, especially P accumulation. Also, through outreach programs, we will continue to educate growers on nutrient management strategies through environmentally sound best management practices.

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SARE
Sustainable Agriculture Research and Education
Southern Region

LS95-70
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Effects of Organic and Chemical Fertility Inputs on Soil Quality in Limited-Resource Vegetable Farms

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Project duration
3 years

Budget:
SARE $184,319
ACE Matching $56,952

Small-market vegetable farmers produce high value crops whose success is dependent on maintaining or enhancing the quality of their soil. The objective of this project is to study the effects of conventional fertilizer and composted wastes as fertility amendments on the biological, chemical, and physical attributes that constitute soil quality and influence crop yield on six limited resource vegetable farms in the mid-Atlantic region.

Objectives

1.) Assess the effects of organic and inorganic soil amendments on selected soil biological, chemical, and physical properties indicative of soil quality on limited resource vegetable farms in the mid-Atlantic region.

2.)Teach vegetable farmers to perform simple on-farm tests to determine the effects of their production practices on soil quality.

3.) Develop fact sheets for distribution to farmers on:

a.) Effects of organic and inorganic fertility on soil quality, and

b.) Sampling and monitoring soils for indicators of quality.

4.) Conduct field days for farmers, extension agents and educators, agricultural consultants, and researchers to share the results of the field studies and the methods that farmers can use to monitor soil quality.

5.) Present the results of the effects of organic and inorganic fertility on soil quality and a practical guide to monitoring soil quality at the Virginia Sustainable Agriculture and the Carolina Farm Stewardship Association conferences.

6.) Write research articles on the effects of organic and inorganic fertility on soil quality.

Approach

The farms are located in the Coastal Plain, Piedmont, and Blue Ridge soil physiographic provinces. All farms produced tomato (*Lycopersicon esculentum L.*) during the second year of the study. Three of the producers are long term biological farmers and three have a history of chemical weed and insect control. Two fertility treatments, a conventional treatment using commercial fertilizer and an alternative treatment using compost, were employed. The conventional fertilizer consisted of ammonium nitrate, triple superphosphate, and muriate of potash designed to meet the recommendations of nitrogen (N), phosphorus (P), and potassium (K) for each farmer's crop and pre-existing soil test level. The alternative soil amendments, composted cotton gin trash and composted yard waste, were applied at rates to meet or supplement the nitrogen needs of each crop according to estimated N mineralization rates. Individual experimental plots measured 25 feet by 25 feet, and treatments were replicated three times in a randomized complete block. Fertility sources were applied onto plowed and disced or roto-tilled soils in the spring and immediately cultivated into the soil. Tomato seedlings ('Celebrity' or 'Mountain Spring') were transplanted within one week of soil amending.

Soil was sampled twice from each plot during the season. Samples were collected to a depth of 12 inches at early flowering for extractable P, K, Ca, Mg, Mn, Zn, Cu, and B; pH; total Kjeldahl N; NH_4-N; NO_3-N; total C; organic matter; cation exchange capacity; total P; and microbiological indicators. Immediately following harvest, soil was sampled for extractable P, K, Ca, Mg, Mn, Zn, Cu, and B; pH, bulk density, water-holding capacity, aggregate stability, and the microbiological indicators. Fresh yield was determined by collecting and weighing ripened, marketable tomato fruit from a 12-foot section of the center row from each plot.

Results

Populations of beneficial microorganisms in soils with a history of organic production practices (especially populations of *Trichoderma* and *Gliocladium* spp. and total bacteria) were higher initially (at planting in 1996) than in soils under conventional production practices (inorganic fertilizer and synthetic pesticides). Furthermore, soils with a history of organic production practices have a greater capacity for population growth than the conventional farms. The addition of composts to soils with a history of conventional practices increased the baseline populations of the beneficial soil fungi *Trichoderma* and *Gliocladium* spp. and the thermophilic microorganisms. Soils with alternative amendments always had lower populations of plant pathogenic *Phytophthora* and *Pythium* spp than soils amended with fertilizers.

The composted waste improved soil quality

croorganisms. Soils with alternative amendments always had lower populations of plant pathogenic *Phytophthora* and *Pythium* spp than soils amended with fertilizers.

The composted waste improved soil quality more than commercial fertilizer by: increasing soil concentrations of the nutrients P, K, Ca, Mg, Mn, Zn, and B; increasing soil pH; increasing soil organic matter; and reducing bulk density after only the second year of treatments. A trend toward increasing soil total C, cation exchange capacity, and plant available water holding capacity was observed after one year, but the second season's analyses have not yet been completed; and aggregate stability has not yet been run.

The results after only two years of treatment is interesting because previous research has shown that three to five years are normally required to see any benefit from organic amendments, usually in the form of yield increases. Our research indicates that many soil chemical, physical, and biological attributes can be enhanced after only two years of organic amending. Composted waste applications increased organic matter and reduced bulk density, two properties especially difficult to improve during short time periods, within two years. Yields were not significantly different between fertility treatments, possibly due limitations of plant available N due to incorrectly estimating N mineralization from the organic sources. Populations of thermophilic microorganisms and *Trichoderma* and *Gliocladium* spp in historically inorganic fields can be brought up to levels comparable with organic fields in a short period of time. Increases in populations of thermophilic microorganisms and *Trichoderma* and *Gliocladium* spp and reductions in *Phytophthora* and *Pythium* spp can occur over the span of a season. If this corresponds to an increase in yield (or an increase in future yields) then information on the abundance of these microorganisms may be important as part of a soil quality indicator package.

Impact of results

Sustainable agricultural systems require that non-renewable resources not be depleted and air, water and soil quality be maintained or improved. Recycling of organic "wastes" as soil amendments and fertility sources for agricultural soils can slow the depletion of oil and mineral reserves by substituting materials normally diverted to landfills for commercial fertilizers, whose mining is environmentally degrading and production is energy-intensive. Furthermore, recycled organic wastes provide organic matter, an important constituent of biologically active and productive soils, which is not found in commercial fertilizers. The results after two years indicate that the chemical and physical attributes of composted waste-amended soils can be enhanced above those of commercially-fertilized soils, and that yields with composts can be comparable to those of commercially-fertilized soils. In addition, organically-managed soils have higher populations of beneficial and lower populations of pathogenic microorganisms, which may predispose conventionally-fertilized soils to greater incidences of disease. Continuing study will determine whether long-term fertility, soil quality, and crop productivity can be enhanced with organic fertility sources.

Potential contributions

The use of organic soil amendments may result in a soil that has greater capacity to resist the spread of plant pathogenic organisms; thereby, requiring reduced use of fungicides. This can lower farmers' costs and the risk of pesticide contamination of food. The improvement in overall soil quality may reduce the potential for nutrient contamination of ground and surface water and produce more vigorous-growing and high-yielding crops. Many potential sources of organic soil amendments are currently buried in costly landfills or underutilized in relation to commercial fertilizers. Increasing use of composted wastes will reduce the costs of landfilling wastes and the environmentally damaging (mining) and energy intensive (petroleum-based) fertilizer production practices.

SARE
Sustainable Agriculture Research and Education
Southern Region

LS95-71
Final Report
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Developing Municipal/Farm Linkages for On-Farm Composting and Utilization of Yard Wastes: A Regional Resource Issue Project

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Emily Chewning
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Objectives

On-farm recycling of organic wastes can benefit both agricultural and urban/suburban communities by producing a valuable soil amendment, improving waste management economics, and reducing landfill burden. A joint project between Virginia Cooperative Extension (VCE) and the Rivanna Solid Waste Authority (RSWA) project was designed to develop and document a process to divert municipal yard wastes, a natural resource, to farms for composting and agricultural use. Program objectives included:

1.) Develop an approach to link municipal waste authorities and farmers for recycling and utilization of yard wastes in agriculture;

2.) Ensure successful composting by farmers by providing technical and economic training and assistance;

3.) Promote on-farm composting by developing and conducting educational programs for farmers and agricultural professionals;

4.) Demonstrate the benefits of compost application on soil, physical, chemical and biological properties and crop growth in on-farm tests; and

5.) Develop a manual, in hard copy and electronically formatted, that provides a framework for use by waste managers for implementing a yard waste distribution and on-farm composting program.

Approach

Virginia Cooperative Extension project coordinators collaborated with the RSWA to develop a plan to deliver leaves collected in the fall and winter of 1994 and 1995 to area farms. The RSWA and local Extension personnel solicited farmer participation through advertisements and personal contact. Two informational meetings were held to present the details of the program. Six farms, including landscape/nursery, organic vegetable production, and beef cattle operations, participated in the program.

An educational program was developed for participating farmers. The program included: a) a field trip to visit an on-farm composting operation in northern Virginia; b) a 30 page composting principles and resource guide, containing tables and charts for recording project expenses and process information; c) training in cost allocation to enable an economic assessment of the composting operation and the value of the end-product.

Five farms each received between 180 and 250 cubic yards of bulk leaves in mid-March of 1996. The sixth received approximately 160 tons (~1610 cubic yards) of bagged leaves which were debagged by municipal workers at the farm. The total volume of leaves delivered to all 6 farms was approximately 2600 cubic yards. All but one of the operations co-composted the leaves with chicken or turkey litter from production operations in nearby counties.

Windrow construction and turning/mixing was accomplished with a tractor and bucket and, sometimes with a manure spreader. Four of the participating farmers utilized a RSWA tractor-pulled type windrow turner to turn their compost at least three times. Additional turning and mixing was conducted with a tractor and attached bucket or fork. Project personnel made regular farm visits to provide composting technical support.

Two on-farm field and greenhouse studies were conducted to compare the effects of compost and commercial fertilizer on soil or potting media physical and chemical characteristics and plant growth and yield. Sweet corn was grown at one location and rooted cuttings of two potted perennials were utilized at the other. The research process has provided a basis for further independent investigation on the part of participants. Economic evaluations that compare the expenses of leaf delivery, composting, and compost utilization with the expenses of landfilling wastes and commercial fertilizer were also conducted.

Project outreach activities have included : a) an On-Farm Composting Field Day (June 1996) to demonstrate the windrow system at a participating farm and an aerated static pile system at a nearby farm; b) a 1996 municipal yard waste composting educational forum, sponsored by the Virginia Recycling Associa-

Project duration
2 years

Budget:

SARE	$69,167
ACE Matching	$24,522

tion Organics Recycling and Composting Committee; c) dissemination of program development and progress through a poster at the Composting Council's 1996 annual conference and presentations at the 1996 Composting in the Carolinas Conference and the annual Virginia Sustainable Agriculture Conference; d) the production of articles and publications for extension agents and farmers; and e) an educational program and technical support for a pilot project in another Virginia county.

Measurements

Project progress was measured by the degree of composting success, the adoption of proper composting processes by participating farmers, field day evaluations, attendance levels and feedback at other information/education events, quantifiable results from the field and greenhouse studies, the successful production of project publications, and the continuation of a successful partnership program in Albemarle County.

Results

Finished compost has been successfully used in organic vegetable production and landscaping projects, sold in bags from a nursery retail operation, and sold in bulk from at least one farm. The range in cost for labor, co-composting materials, and all equipment use except the windrow turner for the four farms which used the turner was $4.36 to $17.40/cubic yard of finished material. The highest farmer cost resulted from extensive windrow construction activities necessary because of the inflow of many more leaves than originally planned, as well as other unanticipated circumstances.

The City of Charlottesville incurred an additional $1,970 in hauling and labor costs. Project expenses for the RSWA totaled $1,993. This program, however, allowed savings in avoided costs for the RSWA and the City from pending closure of the current leaf collection / stockpile.

All of the farmer participants are continuing to compost for on-farm use or sale of the finished material. One of the participating farmers signed a 5-year contract in 1997 with the City to receive at least 1,000 tons of leaves annually. This entrepreneur purchased a windrow turner and has established a successful commercial composting operation.

Results of the sweet corn field study indicated that although yield was higher in the fertilizer-amended plots than in those receiving compost, soil TKN and concentrations of calcium, magnesium, manganese and boron were higher in the latter. The greenhouse study involving two common bedding plants revealed that composted yard waste can be employed as a substitute in part or in whole for the commercial potting medium, Promix™.

Outreach activities successfully included other waste managers, farmers and educators. Thirty-one people attended the on-farm composting field day. The Municipal Yard Waste Composting Forum drew approximately 30 participants. The poster session at the Composting Council Conference reached more than 200 individuals. Approximately 25 people attended the presentations at the Virginia Sustainable Agriculture Conference and the Composting in the Carolinas Conference. In addition, waste managers and farmers in two other counties requested information and guidance in developing similar programs for their areas. One of these cases resulted in a successful pilot composting project utilizing leaves and poultry litter from the Roanoke Valley and from which plans for a full-scale operation are proceeding.

Four Extension publications have been or are in the process of being produced: 1) *On Farm Leaf Mulching: An Option for Farmers and Municipalities* (VCE 418-017), a 4 page bulletin; 2) *On-Farm Composting: A Guide to Principles, Planning and Operations* (VCE 452-232) a 36 page guidebook for farmers; 3) *Closing the Loop: Public-Private Partnerships for On-Farm Composting of Yard Waste* (VCE # pending), a handbook for waste management entities and/or groups of farmers and others to utilize in establishing programs similar to that in this project; and 4) *Compost: What Is It and What's It To You?* (VCE 452-231), a four-color educational fact sheet for use by Waste Managers and others seeking to establish a program.

In addition, an article entitled *Yard Waste Composting Opportunities for Farmers are Enhanced by Available Exemptions From State Regulations*, was published in the December 1995 Crop & Soil Environmental Science News and the Winter 1995/96 issue of the *Virginia Biological Farmer*, the quarterly journal of the Virginia Association for Biological Farming. Project publications will be available on the VCE web site.

Impact of results

Establishing linkages between the agricultural and urban/suburban communities can help all parties realize the benefits of municipal yard waste recycling on farms.

Composting yard wastes with farm wastes can produce a valuable soil amendment, improve economics for waste management agencies, and reduce the burden on landfills. This approach serves the goals of sustainable agriculture by enhancing agricultural and horticultural soil productivity, protecting water resources, and reducing the use of non-renewable resources.

Potential contribution

This project has demonstrated that increasing waste recycling through composting of municipal yard trimmings and agricultural manures on farms can be an attractive opportunity for many farmers and an economical option for waste managers. Project publications providing guidelines for farmers and tools for communities to establish linkages and create successful education and implementation programs will promote similar partnerships throughout the South.

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Agronomic and Economic Benefits of Intercropping Bean with Banana

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Objectives

The project is intended to determine agronomic and economic benefits by intercropping bean with banana. There are three objectives:

1.) Determine the effects of planting time and frequency of bean on yield and quality of banana.

2.) Determine additional benefits of intercropping as contribution to nitrogen fertility, weed control and soil and water conservation provided by intercropped bean.

3.) Determine the economic feasibility of the best planting time and frequency of bean/banana intercropping on a semi-commercial scale.

Approach

The project is intended to determine agronomic and economic benefits by intercropping bean with banana on a private farm in Aguas Buenas, Puerto Rico. For achieving the first objective, two bean cultivars, Arroyo Loro and 9443-1, have been intercropped either once or twice with a banana cultivar, Grand Nain, in the first field experiment.

We have completed harvesting all series of bean intercropped with banana at four different timings and two frequencies. The best timing and frequency were found to be the November planting of banana intercropped with two consecutive crops of bean, the first planted at the time of banana planting and the second planted immediately after first bean harvest.

The harvest of banana fruits has also been completed. Banana yields were not significantly affected by either one intercropping or two intercroppings of bean.

For achieving the second objective, soil and banana leaf tissue samples were collected from the field experiment and analyzed under laboratory conditions for nitrogen content to determine the contribution of bean plants to soil nitrogen fertility. Preliminary data from soil analyses indicated that the total nitrogen, ammonium nitrogen and nitrate nitrogen contents of the soil did not differ significantly between the bean-intercropped and non-bean intercropped treatments. The laboratory analysis data of banana leaf samples showed that there was no difference in nitrogen content on leaves between the intercropped banana plants and those of banana monoculture plants.

The contribution of bean plants to weed control was also determined from the same field experiment by counting weeds present in plots after the harvest of the bean. The shading effect of bean leaf canopy significantly reduced the weed population in bean-intercropped plots during the November and January plantings. In the March and May plantings, there was no significant difference in number of weeds between the bean-intercropped plots and non-bean intercropped plots.

We are still in the process of collecting biomass data for determination of magnitude of soil loss under bean-intercropped and non-bean intercropped conditions for objective 2.

To achieve objective 3, a semi-commercial field experiment on the economic feasibility of adopting the bean/banana intercropping practice was initiated in November 1996. The best bean cultivar, Arroyo Loro, was selected for inclusion in this experiment. Two series of intercropped beans were harvested, however, the banana plants are still pending for harvest next year.

Project duration
3 years

Buaget:

SARE	$99,845
ACE Matching	$50,239

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Soil Conservation and Pest Management Impacts of Grass Hedges

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Objectives

1) Evaluate erosion-control effectiveness of grass hedge field plantings established according to existing USDA-NRCS draft interim practice standard.

2) Increase understanding of response of arthropods in cotton production systems when permanent grass hedges are implemented.

3) Increase information delivery of grass hedge technology to limited-resource farmers.

4) Evaluate farmer responses to farming with grass hedges and share experiences with others.

5) Incorporate new knowledge and experience obtained through objectives 1 to 4 into improved USDA-NRCS standard and specification for this practice.

Approach

Erosion control effectiveness was evaluated by observing and surveying fields where hedges had been in place for periods up to 6 years. Data from these surveys were compared with surveys made in these fields in previous years to determine changes in land slopes. Rainfall was measured at the experimental fields to allow development of a computer model to permit extrapolation of observed data to other fields and into the future.

Computer erosion prediction programs including WEPP and RUSLE were used to model the amount of erosion that would be expected in the field in the absence of hedges. The models were then run including the influence of the hedges. The differences between observed changes to land slopes from survey data and those predicted by the models was interpreted to quantify the contributions of tillage and water erosion/deposition to observed landscape changes.

Insects were monitored with pheromone traps and, later, with sweep nets in four fields in Mississippi and Arkansas. Winter temperature regime in hedges was monitored to determine the value of hedges as overwintering habitat for insects. Insect population, crop growth and yield samples were taken in transects oriented perpendicular to the grass hedges.

Rainfall intensity and sediment accumulation above measured at the Brybena Wyatt farm by Alton Johnson. Johnson assumed responsibility as project leader at Alcorn State University following the retirement of Suresh Tiwari in July. Bernard Cotton interviewed Ms. Wyatt concerning her perception of the hedges.

Grass hedge technology was presented by Dabney in an invited presentation to over 100 county agents and farm advisors at the Water and Environmental Programming Conference, a southern region water quality workshop for extension agents, specialists and other agency professionals, 5-8 April 1997, Tulsa, OK. Hedge technology was also discussed in two papers presented to the International Conference on Management of Landscapes Disturbed by Channel Incision, 20-22 May 1997, Oxford, MS. Results of landscape modification survey data were presented at an International Symposium on Tillage Translocation held in Toronto Canada in July. Teague has presented entomological results at several forums in the region.

Results

Steps heights of more than 0.3 m developed across 1.5-m wide grass hedges over a period of three years of tilled fallow. The hedges were spaced 20 m apart and the average slope of the fallowed intervals declined from 6.8 to 5.2%. Maximum elevation increases of 0.2 m occurred 1 m upslope of the hedges in swale positions. Maximum elevation decreases were located below the hedges in the swale positions and on shoulders. Soil elevations changes in the center of the hedges were minimal. Apparent erosion rates based on survey data were higher than predictions of RUSLE and WEPP. Aggradation occurred on approximately 50% of the total area, whereas WEPP predicted deposition only in the 7% of the landscape occupied by grass hedges. It is believed that tillage translocation accounted for approximately 50% of the soil movement and landscape benching observed.

Shorter-statured switchgrass accessions were selected and evaluated at the Jamie Whitten Plant Materials Center. Results are promising that accessions can be developed which have the necessary stem size and strength to make an effective hedge but that are not so tall that they reduce crop yield unless mowed. This development will narrow the practical width of hedges to values smaller than the width of a farmers mowing machine and so take less land and less

Project duration
3 years

Budget:
SARE $137,352
ACE Matching $150,000

maintenance.

Switchgrass appears to be a poor overwintering habitat for boll weevils. Weevils that overwinter in hedges emerge early in the year and so are more easily controlled than weevils overwintering in deciduous leaf litter on field boarders. Switchgrass hedges with associated volunteer forbs were associated with increased populations of beneficial insects. Short mowing the hedges greatly reduced available habitat and all insect populations were reduced.

Farmers who create "water furrows" to facilitate surface drainage find hedges challenging. There is a tendency for farm hands to cut the water furrows through the hedges in swale positions, where the need for erosion control is greatest. While this practice reduces hedge effectiveness and risks creating a gully, during 1997 where such furrows were cut, sediment quickly re-filled and grass recolonized disturbed areas and hedges continued to trap sediment. Better management could include providing subsurface drainage to control local wet spots.

Impact

This project offers farmers an inexpensive biological water erosion control alternative that is compatible with all tillage systems. Hedges may replace costly terraces and are appropriate to land where terraces cannot be constructed either because of shallow soils or the lack of an appropriate outlet. On flat sandy lands, hedges can control wind erosion and improve water quality. Hedges increase habitat diversity and, depending on layout and management, may have important integrated pest management and wildlife benefits.

Based in part of the results of this project, Mississippi became the first state to add grass hedges to their Natural Resources Conservation Service (NRCS) Field Office Technical Guide (Practice Code 205, Vegetative Barriers) and to make it eligible for cost sharing under the EQIP program. Two of the project participants, Dabney and Douglas, are participating in a national NRCS task force for the revision of the national standard and specification for grass hedges.

In the coming years, the impact of hedge mowing regime on arthropod pests and beneficial insects will continue to be studied. The attitudes of farmers participating in this project toward grass hedges will be assessed and their experiences will be reflected in future hedge design standards. A computer model to assist field offices in hedge design and layout will be developed. It will predict long term (50 to 100 year) landscape changes resulting from farming between hedges and the impact of these changes on future soil productivity, runoff, and erosion.

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Improving Integrated Resource Management Skills of Beef Producers

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Cooperators continued on next page

Objectives

Producers with effective information systems who process information using appropriate integrated resource management (IRM) tools and use the knowledge gained in a timely manner are better equipped to survive in a globally competitive environment. This project will:

1.) Identify technological tools supporting IRM by reviewing software. Educational programs to teach beef producers how to use the tools for better decision-making will follow.

2.) Develop case studies to document producers selection and application of decision-support tools and IRM practices. Interdisciplinary IRM teams, following a case study research protocol, will visit farms and gather information. From case studies, critical success factors in management will be identified. Special efforts will be made to ensure a variety of farm types and management styles, including beginning and small farms.

3.) Identify IRM research and education needs through forums in which producers share information and ideas with other producers and suggest areas where additional research is needed.

Approach

This project promotes the development of management skills and improved resource management practices, thus building human capital. Expected outcomes of the project include greater adoption of IRM technological tools, improved on-farm information systems, and greater understanding of IRM concepts with increased feedback to researchers on high priority IRM needs. Audiences for research results include beginning and small farms, commercial operations, and agricultural industry professionals. Educational programs will include intensive workshops, publications, television, radio, an electronic mailgroup for discussion, plus materials on an IRM Internet home page.

Project duration

3 years

Budget:	
SARE	$163,642
ACE	
Matching	$330,313

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Crop Management Systems for Improving Production of Culinary Herbs in the Virgin Islands

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In the Virgin Islands, herbs are common ingredients in the local cuisine, satisfying the palates of visitors as well as residents who used them everyday. Sales of herbs are a major source of income for many small-scale growers in St. Thomas and St. Croix. However, locally grown herbs are available only at roadside stands and do not constitute a significant V.I. export despite the economic importance and potential for significant income.

There is little research information on sustainable crop management practices to improve production levels, processing and marketing of herbs and spices in the Virgin Islands. Furthermore, there are few extension recommendations on efficient and sustainable cropping practices for growing herbs in the Virgin Islands. Some herb growers are already utilizing low-input management practices such as application of organic manures and composts, but most are still using high inputs of chemical fertilizers and pesticides.

The overall objective of this project is to develop sustainable crop management systems to enhance production of culinary herbs through the use of organic mulches, composts, green manures, intercropping and microirrigation.

Objectives

a) Develop sustainable soil management practices for culinary herb production using crop rotation with green manures, application of composts, animal manures and other organic fertilizers.

1) Evaluate sustainable weed management methods for culinary herbs using organic mulches, cover crops and biodegradable synthetic mulches.

2) Develop environmentally sound disease and pest management practices for herbs through cultural methods such as intercropping and crop rotation.

3) Increase fertilizer and water use efficiency in herb production by using microirrigation, thereby reducing fertilizer inputs and conserving water, a scarce resource in the Virgin Islands.

Approach

To demonstrate sustainable crop management practices, experiments were conducted at experiment station and farmers' fields. At the experiment station, a study was conducted to evaluate growth and yield response of chive, parsley, purple and sweet basil planted in rotation with three tropical green manure crops including cowpea, hyacinth bean and sunnhemp.

Green manure crops were established in plots in June, 1996 and mowed in October, 1996. Samples were taken to determine fresh and dry matter yield. Plots were disk-plowed to incorporate green manures into the soil. Two months later, plots were prepared and seedlings of herbs were transplanted into three rows, 4 m long. No fertilizer was applied to any of the plots. The trial used a randomized complete block design with 3 replications.

Sunnhemp produced a significantly higher dry biomass yield than hyacinth bean and cowpea. The data for the third harvest showed that parsley from the sunnhemp and hyacinth bean rotations were significantly taller and more productive than from the cowpea and natural fallow plots.

No significant differences were observed between green manures as to their influence on plant height, fresh and dry matter yield of chive, however, the data showed that fresh yield was highest for chive grown after hyacinth bean and lowest for cowpea.

For both types of basil, no significant effects on total fresh and dry matter yields were observed due to green manure rotation. The green manures, however, had a significant effect on sweet basil plant height prior to the fourth harvest. Sweet basil was more productive than purple basil.

This study indicates that during the initial stage, some culinary herbs can benefit when grown in rotation with green manure crops such as sunnhemp and hyacinth bean.

At the V.I. Department of Agriculture demonstration plot, a study was conducted to compare the effects of various mulch types on the grown and yield of parsley. Parsley was planted in plots consisting of 3 rows spaced 40 cm apart and a length of 5 m. Plants were spaced 30 cm within rows. Mulch treatments included black fabric (weed barrier), silver film, white plastic, grass straw and a non-mulch treatment. The experiment was laid out using a randomized complete block with 4 replications. Data on plant

Project duration
3 years

Budget:
SARE $143,529
ACE
Matching $62,420

height, fresh and dry matter yields were collected for each harvest. Weed population and weed weight were determined before each weeding operation.

Results

Results from three harvests indicated that no significant differences among mulch treatments in terms of total fresh and dry matter yields, but for the third harvest, the straw mulch plots produced significantly higher yields of both fresh and dry parsley, compared to the weed barrier and white plastic mulch, respectively.

Overall, plants from the straw treatment were significantly taller than from other treatments except the non-mulch treatment. Except for straw, all mulch treatments were effective in controlling weeds compared to non-mulch treatment. Nematode infestation was less in plots with black fabric (weed barrier) mulch and high in silver and white on black mulch.

A separate experiment was conducted at the V.I. Department of Agriculture to determine the productivity of chive fertilized with various levels of cow manure. Chives were planted on plots measuring 1.20 x 5 m. Plots were fertilized with 0, 10, 20 and 40 tons per hectare of cow manure containing 2 percent nitrogen. Data on plant height and fresh yield were collected and analyzed. Results indicate no significant differences in the parameters measured, however, there was a tendency for the plant height to increase as level of cow manure applied increases. Towards the end of the trial growth and yield was affected by heavy infestation of thrips.

In farmers' field a trial was conducted to demonstrate the effect of various mulching materials on yield of chive. Chive was planted in plots consisting of three 5-m rows spaced 40 cm apart. Plots were mulched using black fabric (weed barrier), silver film, white plastic and grass straw. A non- mulch plot was included as control. Data on plant height, number of stems fresh and dry matter yields were collected for each harvest.

Results indicated that chives grown under straw mulch are taller and have higher fresh yield than those grown with other mulches. All mulching materials maintained integrity except for the silver film. A combination of rainfall and high temperatures caused the silver film to lose the silver coating on a large percentage of the mulch. The material tends to deteriorate over time and losses its effectiveness in controlling weeds. Similar results were obtained with parsley where the straw mulch was superior to synthetic mulches in terms of its effect on parsley fresh yield.

Impact of results

Although the project has completed for only one season of field study, there are some indications that the results will have some impact in Virgin Islands and on southern agriculture. For example, the use of green manures such as sunnhemp and hyacinth bean has the potential of reducing fertilizer input in herb production when they are grown in rotation with herbs. The use of organic mulch such as grass straw improves the yield of herbs as compared to synthetic mulches such as white plastic, silver and black fabric. Since green manures and straw are resources which are locally available, their utilization will contribute to the reduction in production cost increasing growers economic returns and lowering food cost for consumers.

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Integration of Pastured Poultry Production into the Farming Systems of Limited Resource Farmers

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Project duration

3 years

Budget:
SARE $149,624
ACE
Matching $135,900

Limited resource farmers in the USA need profitable farm enterprise alternatives to survive on the farm. In this project, Heifer Project International (HPI) in cooperation with numerous collaborators are giving limited resource farmers the opportunity to test a relatively new farm enterprise that is both economically and environmentally sound. That enterprise is pastured poultry. Pastured poultry is an endeavor in which broiler chickens (in this case) are raised on pasture in pens that are moved across the pasture daily. The chickens receive sunlight, fresh grass and fresh air everyday and are usually processed on the farm. No antibiotics are required in the feed. The system is healthy for the livestock, builds the soil with manure from the chickens, and provides the farmer with a decent return from this value added product.

Objectives

1.) Provide hands-on training in pastured poultry production, to 24 farm families who are currently members of farmer organizations that are supported by Heifer Project International. Training will include survey information generated on the success, impact and problems that 10 other farmers have experienced in pastured poultry production.

2.) Review and summarize federal and state laws regarding on-farm processing of poultry.

3.) Provide training in food safety and legal issues for the same twenty-four families and to assist them in complying with the laws in their state.

4.) Provide training in market development of farm products for the same farmers

5.) Help these 24 families conduct on-farm practical trials of pastured poultry and its integration with their other farm enterprises

6.) Include at least eight technical advisors (county extension agents or advisors from other local organizations) in the training program so they are prepared to support and encourage these families and others in the community

7.) Develop and implement monitoring systems that will provide useful information (income generation, pasture management, farm labor management, quality of life implications, farmer observations and problems) about integrating pastured poultry into a farming system

8.) Provide follow-up guidance and assistance to the families as they diversify their own production and marketing

9.) Aid in the development of the American Pastured Poultry Producer's Association (APPPA), which will serve these farmers and others around the country by providing a forum to share information and ideas related to pastured poultry.

Approach

A key component of this project is comprehensive training for farm families and extensionists in all aspects of the pastured poultry enterprise: production, processing and marketing. Two major training events have been held at Polyface Farm in Swoope, Virginia (in June 1996 and October 1997). This is the farm of Joel and Teresa Salatin and family who originated the pastured poultry model. The Salatin family nets $20,000 per year by raising 8,000 pastured chickens during six months of the year. They have been following this model for over 12 years.

These two training sessions in Virginia and others in Alabama, Kentucky, and Louisiana have covered nearly every aspect of pastured poultry imaginable. Participants built chicken pens, moved the pens, learned about brooding the chicks, butchered chickens, received instruction in food safety and legal issues, learned marketing techniques, and learned how to complete the required record books.

After completing training the farmers were given funds to do a small scale version of pastured poultry on their own farms. With the funds each farmer would build a pen, purchase 100 chicks, a feeder and a waterer. Upon receiving their checks, each farmer also signed a contract to "pass on the gift." Passing on the gift is a Heifer Project tradition in which everyone who receives a gift of animals becomes a donor. In this case each farmer who receives funds to start the poultry project is required to return to Heifer Project the purchase price of the chicks and to train another farmer in their area in the pastured poultry enterprise.

In signing the contract, the farmers also agreed to monitor their activities in record books provided to them. The record books included an expense and income log, a folder for receipts, a log to record total pounds of feed used, a daily

calendar to record particular activities or occurrences, an information page on pasture management, a detailed labor summary, questions about the family's values and how this project could impact the quality of life for themselves and their community, and a page on farmer observations and problems.

Before these training sessions began, several preparatory tasks were completed. Anne Fanatico with the National Center for Appropriate Technology's program known as ATTRA (Appropriate Technology Transfer for Rural Areas) surveyed 13 different pastured poultry producers around the country to gain insight from their experiences. Heifer Project International discussed the project with farmers in the organizations which HPI supports and identified the families who wanted to participate. HPI, ATTRA, Southern University (SU), Kentucky State University (KSU) and Tuskegee University (TU) developed record books for the farmers to monitor their progress. The National Center for Agricultural Law Research and Information (NCALRI) conducted a legal review of federal and state laws concerning on-farm processing of poultry in five states (Kentucky, South Carolina, Alabama, Mississippi and Louisiana). This legal review is now being expanded to include all 13 states in the Southern Region.

In addition to farmer tests of pastured poultry, three universities also agreed to demonstrate the model on their farms (Southern University, Kentucky State University and Tuskegee University). During 1997 (the second year of this project) three more universities asked to join our efforts as collaborators (Florida A&M University, Fort Valley State University in Georgia, and South Carolina State University) and we are taking the necessary steps to involve them fully in our future activities.

Results, so far, have been very encouraging. Through the two seasons completed (1996 and 1997), 22 limited resource farmers have received training and tried out pastured poultry on their own farms with assistance from this SARE grant. Most have been very pleased with the results of their work and several have expanded their operations or plan to in the future. In most cases, farmers are finding a good market for the chickens and see pastured poultry as a viable component of their farms.

In addition to the farmers who actually received SARE funds to try the enterprise, several other farmers have received just the training portion of the program and have gone on to start enterprises of their own. This includes at least three producers in Kentucky and one in South Carolina.

In the final two years of this project many more families will be trained and given the opportunity to try pastured poultry. We expect to surpass our objective of 24 families.

Pastured poultry is a sustainable livestock production system that fits in quite readily with other enterprises that farmers often have established. It is good for the people, the land and the livestock. It encourages local food economies and puts more of the food dollar into the hands of farmers. It builds bridges between producers and consumers. It has the potential to keep many more family farmers on their farms.

Pastured poultry has great potential in the south. Consumers are becoming more interested in the quality of their food and limited resource farmers need sound agricultural enterprises that will fit into their current farming systems without putting them over their heads in debt. Pastured poultry fills this need. Farmers can stay at the small scale of operation that this project has helped them achieve or they can gradually move into greater levels of production and make pastured poultry a major aspect of their farm system.

Our outreach to farm families in other parts of the country has expanded significantly in 1997. The American Pastured Poultry Producers Association (APPPA) was organized in January 1997 under the guidance of a Steering Committee of nine producers. Since that time APPPA has published three newsletters and grown to over 300 dues-paying members.

Likewise, the demand for ATTRA's services has surged. Requests for their technical information packet on pastured poultry increased from 45 in 1996 to 323 in 1997. The number of farmers requesting specific technical assistance on pastured poultry increased ten-fold, from seven in 1996 to 70 in 1997.

At the end of the project in 1999, ATTRA will publish case studies of the farmers who participated in this project. This publication will be a tremendous asset to other farmers who consider the enterprise in the future.

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Sustainable Cropping Systems for Seedless Watermelon and Fall Lettuce in Rotation with Green Manures

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Project duration
2 years

Budget:
SARE $182,751
ACE
Matching $92,755

Objectives

The objectives include development of a sustainable crop rotation system for seedless watermelon and fall lettuce grown in rotation with green manure mixtures; exploring alternative markets for melons and lettuce; soil improvement, reduced fertilizer use and improved management practices for producers.

Approach

The research and demonstration are conducted on farmers' fields and experiment stations in North Carolina and Virginia. These sites represent different climates, soil types, marketing options and economic climates.

The cover crop treatments originally were Austrian Winter Pea, hairy Vetch, Austrian Winter Pea and rye, and hairy Vetch and Rye, and a non-planted control. The cover crops were planted fall 96 at seven locations in North Carolina and Virginia at experiment stations and farmer's fields. The cover crop growth and biomass production were not significantly different under the treatments. The biomass production ranged from 3.2 to 4.8 tons per acre. In the spring of 1997, the cover crops were mowed down with a flail mower and left as a surface mulch to control weeds and soil erosion, and retain soil moisture. Two seedless watermelon varieties were transplanted and grown in each cover crop treatment at all of the sites. The watermelon crop was established well in North Carolina sites, but the crop was not established in Virginia sites due to problems of seed germination and transplanting equipment. At Fletcher site (North Carolina), the unusual low temperature (<15 °C) existed until the middle of June 1997, the transplanting of the watermelon seedlings were delayed. Seedless watermelon yields were satisfactory in Guilford, Lenoir and Rockingham counties of North Carolina. In Guilford County, watermelon yields were the highest under Hairy Vetch Treatment (14.7 ton/acre). In Rockingham County, the treatment of Austrian Winter Pea and Rye mixture yielded 29.0 ton/acre and it was the highest among all the sites. Average yield of these three sites was 17.3 ton/acre with a standard deviation of 6 ton/acre. Average number of melons in Guilford, Lenoir and Rockingham counties was 2600 per acre, average weight was 17.3 tons/acre. A quality analysis of seedless watermelon from North Carolina sites conducted by Virginia State University revealed that the average sugar content in the watermelons from sites of Guilford and Rockingham counties was 8.17% with a standard deviation of 0.33%. Cooperating farmers of North Carolina sold all of their seedless watermelons in the local farmer's markets. The harvesting of watermelon in Fletcher was finished at the end of September 1997. Most of the watermelons (> 93 %) were not mature due to the short growth period and low temperature at the high elevation, although the average number of watermelon was 2718 per acre. A survey was conducted by including professionals, farmers, marketeers, household individuals and others to evaluate seedless watermelons from this research and demonstration. Eighty percent of the survey participants favored the taste of seedless watermelon. Ninety-two percent of them showed their preference to buy seedless watermelons even at a higher price than seeded melons.

At the site of Guilford County, North Carolina, we monitored the nitrate leaching in watermelon plots due to cover crop mulch decomposition. The nitrate results showed that decomposition of the cover crop mulch provided enough nitrogen nutrient for the growth and development of seedless watermelon. However, there is a potential risk of nitrate leaching to deep soil or groundwater after the maturity of most of the watermelons. Pest populations were also monitored and there were no real problems with pests and diseases. However, as the cover crop mulch decomposition progressed, weeds became a problem at the middle and late stages of the watermelon growth. After the harvest of the watermelon there was not enough time for fall lettuce crop due to the timely planting of cover crops. Therefore, all the plots were tilled and planted with respective treatments of cover crops. Due to poor performance observed at some sites under the treatments of Austrian Winter Pea and the mixture of Austrian Winter Pea and rye, we replaced Austrian Winter Pea with

Crimson Clover in the fall of 1997. Since September of 1997, the cover crops have been established at all of the sites and they are good.

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Saving the Southern Legacy: Heirloom Plants and Local Knowledge for Profitable, Sustainable Agriculture

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Project duration
2 years

Budget:
SARE $152,817
ACE
Matching $103,971

The Southern Seed Legacy (SSL) is dedicated to saving and increasing the diversity of a complex of plants known to local southerners as "old timey varieties", "passalong plants", or "heirlooms". As the American South was transforming itself from an agrarian-based society into a dynamic economic force in the United States in the years after World War II, both scientists and the general public turned away from rural customs, farm tools, cultivation and husbandry techniques, and crops which had for so long defined southern livelihood. In their place came modern machinery, scientific approaches to cultivation, and new, hybrid varieties of crops which provided high yields and agronomic uniformity. The old varieties quickly came to be seen as mere curiosities, obsolete to modern, profitable agriculture, and little more than antiquated symbols of a dying Southern heritage. In recent years, however, changing tastes, markets, climates, breeders needs, and attitudes about food quality and safety have brought about a renewed interest in the old timey plants. The Southern Seed Legacy has taken up the challenge of researching the extent of the survival of the seeds and plants through a participatory analysis of who saves and why, where and how many varieties are still available, what is the cultural significance and knowledge of the "passalongs", and how might this valuable genetic resource be maintained. In the research process, the Southern Seed Legacy is discovering that, contrary to popular belief, there is a far flung but fragile network of southern seed savers keeping varieties that actually and potentially offer low cost, low maintenance, high economic value, and superb culinary and nutritional quality for many Southern producers, gardeners, and consumers who believe in the goals of a sustainable food system.

The Southern Seed Legacy aims to reverse the erosion of genetic variation and cultural knowledge of crop diversity manifested in southern heirlooms through research, education, and outreach. The research component centers on "memory banking", the hands-on interviewing of people and systematically collecting their knowledge in the distinct agroecological zones in order to more fully understand the associated expertise before it disappears as well. In addition, the project actively promotes on-farm and university-based research assessing genetic variability and adaptations of heirloom varieties to further our understanding of their use within sustainable production and post-production systems. The education and outreach component focusses on strengthening and backstopping informal seed saving networks while bridging the generations through the learning process embedded in the "memory banking" methodology. The outreach and educational aim is to sustain the SSL network through creative, interactive presentations and exhibits, display gardens, teaching kits, a "memory website" and SSL-sponsored workshops and seed swaps. As a communication and information network, the SSL links seedsavers and seedseekers in different agroecological zones while encouraging and supporting heirloom cultivation and exchange among growers. While respecting the importance of formal germplasm repositories, heirloom seed companies and national seed exchanges, the SSL network supports the complementary need for decentralized, on-farm ecoregional conservation by southerners themselves.

Specific objectives of the Southern Seed Legacy are to:

1.) Network—Locate and link up individuals, communities, and organizations active in heirloom plant conservation in every state of the USDA-define South. These will form the nodes of the SSL Network.

2.) Document— Inventory the heirloom plant varieties culturally and historically relevant to the diverse peoples of the Southern United States with special attention to rare or "at risk" varieties with declining availability.

3.) Record—Preserve through the memory banking approach the expertise, personal memories, and knowledge of the folk curators as a complement to genetic conservation and enhancement.

4.) Support—Enhance the capacity of farmers and gardeners to preserve, access, and exchange both the genetic material and the relevant cultural information as well as seek potential profitable outlets for their products.

5.) Educate— Use the case of heirloom varieties in the South to reinforce the linkage between cultural diversity, biodiversity, and sus-

tainable farming with educational outreach programs.

The SSL is composed of a wide range of scientific disciplines and user groups to identify, collect, preserve, and multiply the heirloom materials, and to record the cultural information which is embedded in the landraces themselves. The network, therefore, is the mechanism through which all research, outreach, and education takes place. Along with Seedlink, the 500-run bi-annual newsletter, field trips, conferences and seed swaps, the SSL staff located at the University of Georgia and SSL representatives in the field use systematic field collection methods, including participant surveys, memory banking, seed collection, filming and recording, in situ experiments and gene banking. The data are stored in the Ethnoecology and Biodiversity Laboratory and the Sustainable Human Ecosystems Laboratory at the University of Georgia.

Respondents to 68 returned surveys informed the SSL of 790 heirloom varieties of plants. The largest type of heirloom reported was apple (200 varieties in the mountain region and 400 in the Piedmont). One hundred and nine varieties were beans (23 from the Coastal Plains, 57 from Mountain Valley Region, 16 from the Piedmont, and the remainder scattered across the other regions). Out of the 15 varieties of squash reported, the Mountain Valley claimed 8, 4 from the Piedmont, 2 from the Coastal Plain, and 1 from the Flood Plain. Thirteen varieties of corn was reported (6 from the Mountain Valley, 4 from the Piedmont, and 3 from the Floodplain Region). Thirteen types of melons were reported (e.g., cantaloupes, plumgranny, and watermelons). Among the other types were found tomatoes (8), peppers (7), okra (4), garlic (3), peanuts (3), cucumbers (2), and sweet potatoes (2). In addition, there are well over 100 varieties in our genebank which have yet to be catalogued due to their recent collection as a part of the summer "Southern Memories" field school supported by the project. Thirty seven interviews with seed contributors, mainly elderly people, have been recorded and are presently being transcribed.

Research in the hills and Delta region of Mississippi, Arkansas, Tennessee and Kentucky by the Delta Land and Community reveal that heirloom seed saving is still prevalent in the hills (Ozarks, Quachitas, Appalachia) but dying, or has already disappeared, in much of the Delta which is characterized by agro-industrial agriculture. Jim Worstell, Delta Land and Community Coordinator, has learned that heirloom seed saving is considered "morally superior" among some religious groups whereas in the Delta "seed savers are all in nursing homes". Where seed saving is viable, the exchange mechanism is along kin and informal networks of people who know each other well over long periods of time. Worstell reports a large number of varieties which were not included in our survey list or collection, leading us to believe that several of the agroecological regions of the south are rich in seed saving (but obviously not the Delta). Out of the 22 markets studied by Worstell's team, only three or four had seed savers. In cases where there was a seed saver the individual/s knew of others who were often from other states. This pattern rarely occurred in the Delta.

In the refrigeration unit of the Ethnoecology/Biodiversity Laboratory at the University of Georgia 103 accessions are counted with possibly up to another 100 or more to still be catalogued and prepared for storage. During the spring, 1997, several landraces were grown out on an experimental basis in the Department of Horticulture green house at UGA in preparation for a Southern Seed Legacy Garden which was established at the Georgia State Botanical Garden over the summer period. This garden was visited by hundreds of patrons who were able to view a traditional southern garden and read descriptions of each plant on a placard as well as select biographical descriptions of colorful seed savers.

During the year, one book, six articles, and one thesis were published. The book, *Yesterday's Ways, Tomorrow's Treasures: A Guide to Conserving Memories, Seeds, and Other Slippery Gems,* was published by Kendall/Hunt Publishing Company of Dubuque, Iowa. It is a first of its kind and has been well received in education circles. The masters thesis involved a comparison of cowpeas in terms of the biological and cultural value. There is in progress one book by University of Arizona Press, the SSL Resource Directory, a book chapter, one thesis on Moon and Stars Watermelon, and an Ethnographic Research Training Report on seedsavers in the Sea Island and Coastal Georgia. Two copies of the newsletter, Seedlink, was published and 500 copies distributed to participants and potential participants. One website (Southern Memories) was established as a result of a summer field school involving students at the University of Georgia and another website (Memory Web) was supported in part by the SSL. Four paper presentations were made at major conferences by SSL participants. A conference " Southern Heirloom Gardening" held in conjunction with the Georgia State Botanical Gardens attracted some 30 participants and involved lectures by eminent seed savers and demonstrations of seed saving techniques, plant breeding, and cooking/preservation with southern heirlooms.

The impacts of the Southern Seed Legacy Project is already being felt. Especially noteworthy is the adoption by the older and more established Native Seeds/Search, Tucson, Arizona of the SSL's Cultural Memory approach. The large number of requests via telephone, mail, email as well as invitations to speak, give newspaper or magazine interview, and set up displays at workshops and conferences on sustainable agriculture is an indication of the increasing public awareness of the importance of heirlooms. Some interest has been shown by experiment station breeders in the local germplasm, a notable event given the dismissal of heirlooms in the past.

A potential impact of the project will be in the growing organic market of the South. In the United States the organic market has grown more than 20 per cent annually and now accounts for about $3.5 billion each year. Since landraces do not require the same level of inputs (pesticides, fertilizers) as hybrids, they will play a major role in future organic markets. The SSL has begun a study of the diverse types of potential heirloom markets in the South with a preliminary focus on the Piedmont, Southern Appalachia, and the Atlanta metropolitan area. In addition, the mapping of the distribution of the heirlooms is underway and there will be an attempt to correlate ecological conditions, socioeconomic indicators, and markets with the incidence of landraces.

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Multi-Cropping Cattle and Watermelon in the Southern Plains

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Cattle and watermelons are grown extensively throughout the southern United States. Some farmers produce both commodities, but no one produces both crops on the same land in the same year. Farm diversification with cattle and watermelons would improve cash flow, minimize risks and lead to farm stability and sustainability.

The purpose of this project is to determine if watermelon and bermuda grass pastures can be grown in the same field in the same year. One approach to answering this question will be to grow watermelon in strips in a perennial pasture or meadow. Only a small portion of the pasture will be tilled and planted with melons, and the pasture will then be allowed to return to grass. With this system, cattle producers can diversify their operations, minimize risk, and improve farm profits. Watermelon producers can reduce soil erosion and have a disease-free site for crop rotation.

Objective

Develop techniques for growing watermelon in tilled strips in a permanent pasture.

Approach

The study is being conducted in Oklahoma and Texas. 1997 is the second year of the study. Experiments established at university research stations in 1996 provided preliminary information, and the results were used to further refine treatments in the 1997 study. All treatments were designed with the objective of gathering information about the value of various cultural management techniques for growing watermelon in strips in a permanent pasture, Small scale replicated plots were established in 1996 and maintained through 1997. One on-farm demonstration was conducted in 1997.

In Oklahoma, a field was sprigged with bermuda grass in the fall of 1995 and was also seeded with bermuda grass in the spring of 1996. This field was maintained throughout 1996 and 1997. In the spring prior to treatment initiation, all plots were mowed. Hay was raked and baled. The hay was then removed from the field. Strips 6 feet wide were tilled in preparation for the following treatments. The strips were on 18 ft centers, and plot length was 45 ft. The following treatments were installed in early June, 1997.

1. Control treatment: Weedy check, no weed control attempted.
2. Cultivation early. Poast (sethoxydim herbicide) when needed.
3. Cultivation early. Treflan (trifluralin herbicide) at 3 leaf stage.
4. Cultivation early. Treflan at 3 leaf stage. Poast when needed.
5. Cultivation as long as vine growth permits.
6. Cultivation as long as vine growth permits. Treflan at last cultivation.
7. Cultivation as long as vine growth permits. Treflan at last cultivation. Poast when needed.
8. Clean control: Cultivation plus Treflan plus Poast plus hand-hoeing as needed.

In Texas, a dense stand of bermuda grass existed in the field. The tilled strips were 10 feet wide on 30 ft centers, and plots were 35 feet long. The following treatments were installed in the tilled strips.

Mechanical cultivation
Polyethylene mulch (1.25 mil)
Biodegradable polyethylene mulch
Poast (sethoxydim herbicide)
Mech. cultivation and Poast herbicide
Sudan hay mulch

Measurements

The measurements of primary concern are the yields of watermelons in various treatments. Yields were compared to determine the suitability of each treatment in development of a watermelon and bermuda grass production system. Measurements were also taken of hay production from the field, and of the relative regrowth of bermuda grass into the tilled strips.

Results

In Oklahoma the entire mowed area of the study was about 1.8 acres, and produced five round bales of hay, with each bale weighing about 800 pounds. This hay yield was similar to what would have been obtained from a typical hay meadow. Thus, a satisfactory harvest of hay was obtained before the watermelons were planted.

In 1996, superior watermelon yields were obtained when either a clean control or plastic mulch were used as treatments. While the plastic mulch suppressed weed growth and provided high yields, it was very difficult to remove the

Project duration
2 years

Budget:
SARE $54,752
ACE
Matching $49,600

plastic from the plots at the end of the year. While all farmers who use plastic mulch have experienced this problem, the difficulty was magnified in this study because of the overgrowth of bermuda grass which partly covered the plastic and prevented degradation. from the study in Oklahoma in 1997.

The greatest yield of watermelon came from the At the same time, the grass made physical removal of the plastic extremely difficult. Because of the difficulty of plastic removal, plastic mulches were dropped clean control (trt #8), which was maintained with cultivation, herbicides, and hand hoeing. While this treatment gave a high yield, the inputs were substantial, and the amount of hand hoeing would probably have offset the increased yield. The next highest yield came from the two treatments that consisted of cultivation, Treflan, and Poast (trt # 4 & 7). The next best yielding treatment consisted of cultivation and Poast, without Treflan (trt # 2). While the ranking of these treatments was in the order we have listed, these treatments were not statistically different from each other. Following these treatments, the next highest yield came from plots that were treated with cultivation and Treflan (trt # 6). The treatment with the lowest yield, other than the weedy control plot, was the cultivation alone plot (trt # 5).

The yields were typical of what a farmer might receive from a conventional watermelon field. Most treatments produced in the range of 4 to 5 tons of watermelons per acre. While these yields may seem low, it is important to recall that only one third of the total land area was tilled and planted with watermelons (6 out of 18 feet). If the watermelon yield was calculated solely on the basis of the tilled area, the yield would have been in the range of 12 to 15 tons per acre, which is substantially higher than the average watermelon yield in Oklahoma.

It is also important to recall that one cutting of hay was obtained from the field before the watermelons were planted, that the hay yield was similar to what a farmer might have received, that very little soil was uncovered at any time during the growing season, and that after harvest the field was already replanted with bermuda grass.

In Texas, the treatments focused on cultivation and mulches. Plastic mulch was maintained as a treatment in Texas so that a comparison could be made between plastic mulch and organic mulch as mechanisms for weed control. The greatest yield came from plots with either polyethylene mulch or degradable mulch. The yield from these plots was about 2-3 tons per acre. With about 10 feet out of 30 feet being tilled, the yield from the tilled area alone would have been in the range of 6 - 9 tons per acre, which is an average yield.

The treatment that consisted of mechanical cultivation alone was about one half ton per acre, which would not be considered an acceptable yield. The herbicide (Poast) alone treatment was also unsatisfactory. However, the combination of cultivation and herbicide yielded nearly two tons per acre, or six tons per cultivated acre. The plots that received a hay mulch did not yield as well as the synthetic mulched plots. Likewise, they did not yield as well as the plots that received cultivation and herbicide.

Impact of results

The information gained from this study has indicated that watermelons can be grown in bermuda grass strips. The nature of bermuda grass is such that the grass will rapidly encroach upon the tilled strips, and without rigorous control practices, will overcome the watermelon plants in such a way that no yield will be obtained. This has been shown by the near zero yields that are obtained from the control plots where no weed control was attempted. While some broadleaf weeds were present in the plots, the major competitor with the watermelon plants was the bermuda grass.

It appears that weed control will be the limitation to producing watermelons in this manner, and two mechanisms have been shown to be acceptable for obtaining weed control. Plastic mulches will maintain weed control, but installation and particularly removal of the plastic are cumbersome, labor intensive, and ecologically questionable. Further development in the area of biodegradable mulches may offer further options in this area. The degradable mulches tested so far in this study were not considered satisfactory. Cultivation in combination with contact herbicides such as Poast have also been shown to be satisfactory, with yields being similar to what a farmer might obtain with a bare soil, clean cultivation field.

Other conclusions from this study are that the system is ecologically superior to clean cultivated fields. The low amount of bare soil present at harvest time is an indicator that soil erosion would be minimized with this production system. Similarly, the amount of soil covered by bermuda grass is a good indication that grass or hay can be produced on the same plots next spring. The hay that was baled from each field during the second year of the study has confirmed that both watermelons and hay can be harvested from the same field during a given year, and that the cycle can be repeated during each successive year.

Potential contribution

The information gathered so far indicates that it will be possible for watermelon producers to grow melons in a field that has been in bermuda grass. The bermuda grass will not need to be eradicated from the field. In fact, one cutting of hay can be obtained before the watermelons are planted. Alternatively, the field could be grazed for approximately two months before the watermelons are planted, and could then be grazed after the melons are harvested.

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Alternative Agriculture Strategies for Rural Community Sustainable Development in Northhampton County, Virginia

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Cooperators continued on next page

Project duration
3 years

Budget:
SARE $228,517
ACE
Matching $97,658

Objectives

1). Establish communication network which explores and shares the benefits from and perceived barriers to adopting sustainable agriculture with growers on the Shore, reaching beyond the agricultural community to include other sustainable development and marketing efforts.

2). Identify and evaluate agricultural and economic opportunities including adaptation of sustainable techniques, identification of constraints, development of risk analysis, and evaluation of market strength and potential.

3). Facilitate implementation of on-farm demonstration sites using alternative technology or crops.

4). Conduct research, analysis and feasibility studies to assist farmers in transition to alternative crops and/or technology and the production of value-added products.

5). Evaluate the success of this project by monitoring a) the farmers attitudes and perceptions of agricultural, environmental and quality of life issues and b) the local citizens' perceptions of sustainable agriculture's role in this rural community's vision.

Approach

This project is using grower managed on-farm demonstration plots coordinated with production, economic and environmental research to explore options for lower input and alternative crops linked to value-added marketing and rural community development efforts. The participating growers are supported by an interdisciplinary technical team with expertise in extension service, sustainable agricultural production, niche crop experience, economic feasibility assessment, market development, sustainable community development, conservation, and socio-economic and ecological impact monitoring. The technical team provides support information, on-farm consultation, and management skills for incorporating appropriate sustainable practices into each demonstration plot. This also ensures timely sharing of information between participating growers and with other interested growers on the Shore.

In 1997, our first growing season, a diverse group of participating growers managed nine small demonstration plots using alternative technology or producing alternative crops, within the context of their whole farm strategy and business plan. Technical support for demonstration plots included cover crops and insect scouting. Complementary experiment station research plots were used to collect important sustainable production information. At the same time, the research team helped growers assess the economic risk, market feasibility and environmental impact of the potential new enterprises.

Participating growers are evaluating their selected sustainable agricultural enterprises. Growers are receiving record keeping assistance and technical advice for all stages of production and marketing. Their results will be used to develop sample enterprise budgets and fact sheets as the projects progress from demonstration to viable production levels.

A linear economic model coupled with "Planetor" environmental model has been developed to answer "what if..." questions for different options growers want to evaluate. The model is able to produce market window analysis to evaluate potential profitability, solve for different model assumptions and options to identify best crop mix and net returns, and compare potential environmental impacts for different scenarios. Cost-benefit market research and macro-economic analysis is helping the growers understand the product quality, form and timing needed, potential of markets within reach of the Eastern Shore, and the minimum acreage and yield needed to viably produce these alternative crops.

Participating growers have provided baseline information about their concerns and expectations from the project and visions for their farm operations and rural community after implementation. A survey tool was developed to measure attitudes and perceptions of the barriers to adopting sustainable agriculture on Shore. Analysis will include weighted scoring of practices perceived as sustainable to obtain a "sustainability index". While the number of growers on the Shore do not provide a statistically significant sampling base, follow-up data collection with

the survey will measure any trends and changes in attitudes and perceptions about these issues at the end of this three year grant project.

Results

Despite the extreme drought conditions this summer, several of the demonstration plots provided important production information and enough crops for initial test marketing. This project has assisted growers in exploring economically and environmentally sound management strategies and improved marketing opportunities for several crops, including hayman sweet potatoes, organic seedless watermelons, and dried flowers.

The hayman potato may have the potential, through marketing as a premium product, to become the "Vidalia onion" of the Eastern Shore. The hayman sweet potato is a historically grown crop unique to the Shore. Compared to regular sweet potatoes, its genetically limited yield potential, variable size and shape, and extra storage requirements have prevented this crop from becoming a commercially viable crop using traditional pricing. Working with a participating grower, the Virginia Eastern Shore Corporation is conducting a value-added marketing campaign for the hayman in the Mid-Atlantic region. The publicity associated with the marketing is accomplishing valuable education and outreach locally and regionally related to the goals of this project. A joint effort developed best management practices as a pre-requisite to qualify for this marketing. The project is also helping the grower explore new market opportunities through the Internet. The grower hopes to expand this enterprise to a viable business and provide certified foundation seed stock for future expansion to other interested Shore growers.

An annual and perennial dried flower demonstration plot has provided a new business opportunity for another participating grower. The plot was managed as a demonstration of low-input production and investigation of value-added marketing as potential supplemental income for small and part-time growers. The grower is planning on increasing production acreage next year with business planning to avoid expanding too quickly. The technical team is exploring if production and post-harvest handling of the dried flowers as an enterprise could be coupled to existing or new crafts businesses in the region, developing a separate value-added local enterprise. Outreach helped develop community interest in this area, as demonstrated by local participation in sponsored programs and development of networks with local artisans and community-based groups.

Three growers obtained Virginia state organic certification for their farms this year. One of these growers produced organic seedless watermelons. The grower was able to conduct local and regional test marketing, receiving a per-pound price advantage from organic certification. The grower is planning on increasing production acreage next year with business planning to find markets for larger yield. Another participating grower produced low-input seedless watermelons, providing important comparative production and economic information.

Other crops selected by initial grower interest were investigated through research plots and economic analysis before growers took the risk of growing on-farm demonstration plots. Working with the technical team, growers are selecting other crops to be investigated in this way. Growers will receive production and budget plan information about crops identified as potential candidates for consideration in future demonstration plots.

The analysis of production, marketing, and economic aspects are providing important information and risk assessment so that the growers can more confidently consider expanding beyond the demonstration plot level and further incorporating a transition to sustainable practices into their farm operations. The participating growers are already planning modifications for next year's growing season.

Impact of results

The results from this project will provide information, tools and methods growers can use to evaluate potential new enterprises which involve crop diversification and a transition to alternative agriculture strategies on the Eastern Shore. The goal is to identify viable options for alternative crop and/or technologies which growers can fully incorporate into their farm operation and business plan. Participating growers continue to have a valuable impact on the project's development through their input on the feasibility of different aspects of production and marketing for their individual farm operations. The SARE grant has provided a valuable economic "safety-net" to encourage such full participation by reducing some of the growers' financial risk usually associated with such experiments and transition to new methods and crops.

Potential contribution

Sustainable agriculture and local communities can support each other through purchase of local products and services. Value-added activities can produce returns to the local community which offset reduced input purchases typical of sustainable farms. This project ties directly into the *Northampton County's Sustainable Development Action Strategy*'s "Agriculture Industry Task Force" goal to support the "return of local agriculture to its historic economic level in a manner which sustains the industry at its full economic potential and maintains productive locally-owned farms for the ongoing benefit of all citizens and future generations." Continued community outreach about sustainable agricultural practices which involve better environmental management strategies should improve the community's perception of the impact of agriculture. Community awareness will help generate support for and promote locally-owned, value-added sustainable agriculture enterprises.

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J.W. (Butch) Nottingham
Barbara and Marshall Schwenk
Phylis Smith
Parnell Stachell
John E. Tankard Jr.
K.S. (Pete) Terry
Greg Turner
All Farmers

SARE
Sustainable Agriculture Research and Education
Southern Region

LS97-82
New Project
December 1997

Sustainable Crop and Livestock Systems in the Texas High Plains

Project Coordinator

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NRCS
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High Plains Underground
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Project duration

3 years

Budget:
SARE $222,125
ACE
Matching $73,000

Objectives

1. Compare productivity, profitability, and impact on natural resources of continuous cotton systems, all forage-livestock systems, and an integrated cotton-forage/livestock system.

2. Involve local producers and industry in identifying researchable needs, in developing and testing systems of production, in the development of more effective dissemination of information to end users, and enhanced adoption of new technologies.

3. Link this research with sustainable systems research in other ecoregions to increase the base of knowledge and understanding of the principles that apply to integrated systems.

Approach

Texas High Plains crop production has used precipitation and supplemental irrigation with water pumped from the Ogallala aquifer at rates that far exceed recharge for many years. Over 20% of the U.S. cotton *(Gossypium hirsutum)* crop is produced in this once vast grassland. Most of this cotton is produced in monoculture systems that are economically risky and contribute to wind induced erosion and depletion of ground water resources.

Although large numbers of cattle are found in this region, little integration of livestock and crop production exists. Integrated crop-livestock systems could improve nutrient cycling, reduce soil erosion, improve water management, interrupt pest cycles, and spread economic risk through diversification. Cotton yields per acre may be increased through complementary effects of forages and livestock.

Thus, three systems are compared: 1) a Conventional Irrigated Cotton System using best management practices; 2) an All Forage-Beef Stocker Cattle System to produce feedlot-ready cattle; and 3) an Alternative Integrated Crop-Livestock System for production of both cotton and stocker steers.

The Alternative System integrates cotton in rotation with forages for grazing by steers. Criteria for evaluating these systems includes plant and animal product quantity and quality, net profits, water use, soil conservation and fertility, and input requirements including pesticides, fertilizers, and mechanical operations.

Two cotton experiment stations provide background data and ongoing information for System 1. A university research farm is the site to compare the alternative crop/forage/livestock system and the continuous cotton production system. Three cooperators are providing on-farm testing of the livestock systems and three cooperators will be providing information on the cotton systems. Producers and industry help to identify researchable needs and provide outlets for information.

Information is extended through educational opportunities, publications, field days, involvement of producers and industry as full partners, and linkage with other research sites.

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Southern Region

LS97-83
New Project
December 1997

The Hometown Creamery Revival

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Consultant

Steve Washburn
NCSU

Project duration

2 years

Budget:

SARE	$145,474
ACE	
Matching	$46,585

This farmer-initiated project will explore the revitalization of small-scale dairies and rural economics in the southern Appalachian mountains through creation of unique, ecologically produced dairy products to be offered on local and regional outlets.

The evolution of this work from what might have been a business plan for a new dairy coop into a research and education project resulted from discussions between the participants with regard to the paucity of information available to small-scale dairy farmers interested in trying a new marketing tactic: local Extension agents had no information; farmers were unable to find a dairy processing short course offered closer than Wisconsin; there is not a dairy marketing specialist at the local land grant university, particularly on the niche marketing level; transporting of small amounts of milk from one place to another is practically unheard of, though still referred to in state dairy regulations, and so on.

In systems terms, small-scale dairy farms are generally isolated entities with few relations. Their only part in the larger system has been to provide a certain amount of milk for a certain price, the latter over which they have no control. AT this level, dairies have been relatively unsupported by other entities, either within the system or in the environment outside the boundaries of the dairy production system. This project seeks to weave a web of entities which will support each other, will enmesh small-scale dairy farmers in a secure matrix, and begin to create an equilibrium state for producers, consumers and physical environment.

Connecting farmers with each other, with production and technical specialists, with business and marketing advisors, and with end-users, will create the kind of stable network that will result in success despite seemingly overwhelming obstacles. Through multiple forms of documentation of this project and end-user education, this model can be strong stimulus for regional food security through a Hometown Creamery Revival.

Objectives

The overall goal of the Hometown Creamery Revival Project is to provide a working model for conversion of a small-scale dairy to a producer of value-added products. These products will be produced in a sustainable, humane and safe manner, and will be sold primarily on a local/regional level with a clear component of "relationship marketing" providing the end-user with a stable local source of clean, excellent dairy foods and the farmer with a web of economic stability.

Our objectives, which arise naturally and contribute to the primary goal, include:

1). Conduct necessary processing and market research.

2). Encourage cooperation and information exchange between formerly isolated dairy farmers, and to provide educational resources and opportunities for participating farmers.

3) Incorporate and emphasize soil and water quality improvement, humane animal treatment and food safety as essential elements of sustainable dairying.

4). Design and oversee construction of low-cost facilities for the on-farm manufacture of dairy products, expandable and adaptable for various production capabilities; to investigate requirements for transport of small amounts of fluid milk to allow sharing facilities.

5). Begin production, develop shared marketing tactics and begin trial marketing within the local region.

6). Involve end-users by eliciting direct feedback from them, at the same time informing end-users about health, quality, social and economic advantages of purchasing locally produced products.

7). Document and disseminate all of the above in various user-friendly forms by others.

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Southern Region

LS97-84
New Project
December 1997

Regionally Centered Sustainable Agriculture System

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The Clinch Powell Sustainable Development Initiative (CPSDI) was formed in October 1995 to promote sustainable agriculture, sustainable forestry and nature tourism in a 10 county area in the Appalachian region of Tennessee and Virginia. CPSDI is an action oriented network of community based organizations, Extension agents and other public personnel, loggers, farmers, and concerned citizens. Building on this diverse network, CPSDI has initiated a Regionally Centered Sustainable Agriculture System to further develop and strengthen an infrastructure for sustainable agriculture in southwestern Virginia and east Tennessee.

The specific goals of our project are threefold: Develop innovative markets and high value agricultural products which increase farm income and strengthen relationships between producers and consumers; provide experiential, farm based educational opportunities for young people and potential farmers to encourage productive, rural livelihoods, and coordinate and implement a system of farm based research and technical assistance that improves understanding of sustainable agriculture practices and greatly increases their adoption by local farmers, especially limited resource producers.

Implementation of each of the three goals will be coordinated and implemented by Project Teams. These teams are overseeing a wide range of both research and practical activities designed to expand markets, increase farmer and consumer involvement, and improve farm and community economic viability. Project teams are integrated and coordinated by the CPSDI Sustainable Agriculture Task Force and CPSDI Director, who serves as the project manager. A learning systems approach is being developed so that findings strengthen and enhance the project throughout its two years, rather than simply providing material at the end of the project's life.

As we gain technical knowledge as well as greater experience with education and markets, our learning system approach will continually disseminate these learnings to farmers, community and civic organizations, and Extension and university staff. CPSDI has a well established history as a learning based organization, as evidenced by its frequent participation in regional and national seminars, as well as its publications in periodicals and books. It is expected that this project will have a profound impact on the dissemination of more sustainable agricultural practices, on the broadening of consumer awareness of how to support local, sustainably oriented farmers, and on the capacity of community based organizations, technical support agencies, and land grant universities to assist small scale producers in the forging of more diversified and sustainable rural economies.

Although this project was only launched in August, a number of activities have yielded encouraging results already. This is particularly true in terms of the interest in alternative and sustainable agriculture being displayed by the region's farmers. Four educational events, including a farm tour, a field day and two workshops, garnered more than 80 participants, including dairy and beef farmers, fruit and vegetable growers and potential farmers. These hands-on educational activities covered topics ranging from organic soil fertility to raising crops for commercial markets to intensive livestock management for beef, hogs and poultry. Participant enthusiasm has been very high and several participants have returned for subsequent workshops. One such individual, a farmer and retired school principal who is now a County Supervisor, has even offered his farm for use as a training site for high school and college apprentices.

Interest in participation in research trials is also growing steadily, with four farmers now engaged in garlic production and marketing trials, and several others interested in participating in research beginning in 1998. The work we have begun in developing direct markets - farmers markets, Community Supported Agriculture (CSA), restaurant and retail marketing networks - is generating considerable interest among existing and potential growers, as well as Extension staff who are assisting growers. Plans are underway to develop a new farmer's market in Pennington Gap, Virginia (in Lee County, Virginia's poorest), a CSA project in Russell County, and a pilot food processing facility, or "kitchen incubator" in Hancock County, Tennessee. All of these and other efforts have active involvement and support from local community organizations, farmers, and agencies.

Project duration
2 years

Budget:

SARE	$173,240
ACE	
Matching	$235,635

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Sustainable Agriculture Research and Education
Southern Region

LS97-85
New Project
December 1997

Impacts on Agricultural System Sustainability from Structural Change in Peanut, Poultry, Swine and Tobacco Production Systems

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Project collaborators are using secondary database analysis and coordinated case studies to examine four major Southern farm commodities—poultry, hogs, tobacco, peanuts—to analyze major trends; to assess the impacts of these trends on the structure of agriculture, community well-being, and environmental protection; to determine reasons for both success and failure as farmers attempt sustainable agriculture processes (including diversification); and to outline resources needed by farmers in adapting to major trends. Trends to be analyzed include changes in government programs and regulations, trade agreements, market-driven structural changes, and shifting consumer demands.

Objectives

1.) Document changes in the structure of the peanut commodity system and the responses of peanut farmers to these changes, with a focus on a peanut growing region and associated rural communities;

2.) Document the effects of vertically integrated contract poultry production on the lives and livelihoods of contract poultry farmers and their communities, including documenting the failure of a "free-range" poultry business in North Carolina and conducting a follow-up study of Louisiana poultry communities;

3.) Document changes in the structure of the tobacco commodity system, the responses of Kentucky and North Carolina tobacco farmers, and how structural shifts are affecting the quality of life in tobacco communities;

4.) Identify changes in the structure of agriculture correlated with the development of intensive hog confinement agriculture in Eastern North Carolina and the associated changes in community quality of life, paying special attention to changes in social capital and community conflict.

Project duration

2 years

Budget:

SARE	$174,858
ACE	
Matching	$70,000

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Southern Region

LS97-86
New Project
December 1997

Equal Access to Agricultural Programs and Opportunities

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Minority farmers facing farm crises, discrimination, and neglect, are on a long road to extinction. With them goes the largest source of minority-held equity in the South, and an important base of economic development. Groups fighting this discrimination feel current socioeconomic conditions make it more essential and feasible to replant minority farmers and communities on the land.

Collaborators include the major minority farm organizations based in the southeast, with cooperation from USDA entities and educational institutions. Land Loss Prevention Project will take the lead role in managing and staffing the program. The Rural Coalition/Coalición Rural, a culturally and regionally diverse alliance of over 90 community based organizations, including all the minority farm organizations participating in the project, will organize the training component, in conjunction with a planning team of representatives from participating groups. An advisory committee will assist the team to implement plans and build liaisons with governmental and educational entities critical to effective outcomes for the project.

The program will continue a long collaboration to improve outreach and services to minority farmers. The methods used in the Fall 1996 outreach project to improve minority farm participation and representation on FSA County Committees will be applied to other areas of concern. Farmers and community-based farm advocates will come together in three training sessions with USDA and other institutional representatives for a training and dialogue on a specified area of interest where improvement in program participation and service delivery is deemed important.

Participants will work to apply their knowledge upon return to their communities and will report on results. Representatives of these groups will also work together to strengthen networks and participate in key meetings critical to develop new areas of collaborative work. Findings and recommendations for changes in service delivery will be shared with USDA for implementation.

Objectives

1.) Increase collaboration, training, leadership and skills development, and strengthen networks among farmers and grassroots groups to accomplish not only policy and service delivery change, but to enhance cooperation at the economic level in joint marketing and other ventures.

2.) Through training, skills development, and field outreach and implementation, increase the capacity of minority farmers to access and fully participate in the full range of federal agriculture programs, including sustainable agriculture, marketing and rural, business and cooperative development programs.

3.) Through monitoring and field research, identify specific barriers to minority farm participation in USDA programs, and with USDA and other key institutions, address systematically those problems which have resulted in low participation. Work with the Department of Agriculture on concrete strategies to implement outreach programs and employ other strategies to improve service to producers.

4.) Set in place networks, strategies and methods to increase the viability and number of minority farmers and land owners, especially younger farmers, and through outreach to churches and other significant institutions in the African American community, build more support and investment opportunities which allow the larger minority community to support minority farmers and minority farm organizations in their land retention, technical assistance, marketing and economic development endeavors.

Project duration

2 years

Budget:

SARE	$151,290
ACE	
Matching	$96,900

SARE
Sustainable Agriculture Research and Education
Southern Region

LS97-87
New Project
December 1997

An Integrated Vegetable Production, Postharvest and Marketing System for Limited-resource Farmers in South Georgia

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Stan Prussia
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Objectives

1) Design a 24 hour field to consumer integrated production, postharvest and marketing system and

2) Identify production, postharvest and marketing constraints and opportunities.

A preliminary production, postharvest handling and shipping system was designed for the fall/winter production season. Farmers in four South Georgia counties produce fresh vegetables for sale through the South Georgia Vegetable Producers Cooperative (Brooks County) to Harry's Farmers Market in Atlanta, Georgia.

The system has shown some promise in uniting small vegetable farmers in a marketing cooperative that can capture new markets. However, early experience with the implementation of the initial design has prompted many questions.

Production systems

The range of crops grown in the fall/winter season is limited. Also, because most farmers do not have irrigation, there is significant overlap in the planting and harvesting seasons of cooperative members. The retail outlet can only purchase a fraction of the produce grown by cooperative members. Expanding the number of marketing outlets will help, but production constraints will limit the ability of the cooperative to supply diverse markets with a steady supply of quality produce. Diversification to other cool season vegetables will help. On-farm trials and demonstrations are underway to evaluate the agronomic and economics of several types of radish, carrots, beets and onions. Low maintenance drip irrigation systems that utilize low pressure and volume would be extremely useful for limited resource vegetable farmers in the region.

Another limitation of the system is the method of payment to farmers. Farmers in the cooperative have limited operating capital and the three to four week delay from delivery of the produce to reimbursement is an economic hardship.

Postharvest handling

The current method of postharvest handling of winter vegetables appears to be adequate. However, uniformity in product appearance is a concern for both the cooperative board and the produce buyer. Also, there have been isolated problems with produce quality - either in sizing, damage or cleanliness. The inspection system will need more attention to eliminate these problems.

There is a concern that warmer weather will bring challenges to postharvest handling of produce. A postharvest handling and marketing system must be designed that will assure that the field heat is removed from the crops as quickly and inexpensively as possible.

Tracking the produce from the field to consumer is another concern for the cooperative. A product labeling program will be implemented that will identify the grower responsible for each box of produce shipped to the retail outlet. Records of acceptability of each load will be kept by the retail outlet collaborator and shared with the cooperative board.

Economics

Project personnel are working with farmers to estimate the cost of production of important vegetable crops grown by cooperative members. In addition, data are being collected on daily prices for fruits and vegetables at wholesale and retail levels in Atlanta and Thomasville. These data will be used to estimate the profitability of contrasting enterprises.

The cooperative will also need to generate operating funds. Currently the cooperative subtracts 10% of the price offered by the retail outlet to finance the operation. Often times, the difference in price of what a farmer can receive for selling through the cooperative and local buyers is minimal leaving little incentive for a grower to sell to the cooperative. It is not clear why the price offered by the retail outlet in Atlanta is sometimes lower than the price a farmer can receive through a local broker. More study is needed to uncover the underlying forces of pricing for produce.

Cooperative development

Project personnel are working with cooperative board members to develop group dynamic and leadership skills necessary to successfully operate the cooperative. Modules delivered to date have dealt with how to increase membership in the cooperative, develop trust and resolve conflicts.

Project duration
3 years

Budget:
SARE $ 140,417
ACE
Matching $ 140,260

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Sustainable Agriculture Research and Education
Southern Region

LS97-88
AS97-26
New Project
December 1997

Producers Assessment of Sustainable Land Management Practices to Protect Water Quality

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Environment

Over the last decade, management of agricultural fields focused on preventing over-enrichment with nitrogen. Today we are discovering that phosphorus must also be managed, even in the phosphorus deficient soils of the Southeastern United States. Researchers have questions as to which management systems are working in the Southern Piedmont and farmers have questions as to the efficiency and stewardship of their management practices. We all have something to gain from better understanding of Southern Piedmont streams and their associated watersheds. We have chosen to work in the Rose and Greenbrier Creek watersheds.

Objectives

1. Assess system-wide spatial and temporal distribution of N and P in ground and surface waters in the Rose and Greenbriar Creek watersheds, as related to land management practices;
2. Compare volunteer water quality data collection to technician data collection, and test kit measurement of N and P concentrations to laboratory analysis of the same samples;
3. Evaluate incentives needed to encourage producer adoption of environmentally and economically sustainable management practices; and
4. Increase awareness among agricultural producers, youth, and the community of nutrient movement through the environment and of potential impacts on water quality.

Approach

We plan to look at stream water and runoff water concentrations of nitrogen, phosphorus, and total suspended sediments at plot, field and watershed levels. We will collect and analyze runoff water from farmers' fields and research plots. Stream water samples will be collected upstream and downstream of runoff sampling sites for both base flow and storm flow.

We will establish a central database of farmers' and high school students' data, as well as data collected by researchers. Farmers and the Natural Resource Conservation Service (NRCS) will document land use and management practices in the watersheds. Other data that will be used to gain better understanding of the watersheds include: soils, slopes, weather (weather stations will be placed in the USDA-ARS research area within the watersheds and farmers will collect rainfall on site), initial soil nutrient levels, and vegetation.

An outdoor training laboratory/demonstration site will be developed at an USDA-ARS experiment on Soil Quality Restoration in Forage Based Agroecosystems.

Results

Objective 1: Fourteen sites have been selected and stream cross-sections surveys are done on seven of those sites. Two prototype runoff flumes were built and tested in the laboratory and field. Shields to protect the flumes from cattle were tested in USDA-ARS research paddocks. Two educational field days were held this fall.

Objective 2: Several available field colorimeters and reagents were tested and the Hach Colorimeter was selected .

Objective 3: An initial survey was conducted to determine attitudes about water quality and land management practices among farmers and other residents of the Middle Oconee River Basin.

Objective 4: A workbook for farmer and student cooperator training is being developed.

Potential contribution

Increased awareness of potential water quality problems associated with their management practices is expected to be an important incentive for producers to adopt new management practices. Increased awareness among students of ecological processes within the watersheds and of producer commitment to good stewardship should contribute to increased awareness and positive attitudes within the community about water quality issues. Researcher involvement should lead to better linkage between research and development and adoption of new management practices and technologies. Regulatory agencies should gain better baseline water quality data, particularly seasonal patterns, distributions within watersheds, and links between biophysical and biologic indicators. All of these impacts can contribute toward commitment of diverse individuals and groups to win-win solutions to natural resource problems.

Project duration

3 years

Budget:

SARE	$228,864
ACE	
Matching	$271,059

SARE
Sustainable Agriculture Research and Education
Southern Region

LS97-89
New Project
December 1997

Integration of Freshwater Prawn Nursery and Growout System Into Diversified Farm Systems

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The U.S. imports in excess of $2.5 billion in shrimp products each year. To try to address this need, culture of a freshwater prawn is being evaluated. Compared to marine shrimp prawns have the advantages of not being restricted to coastal regions, have less environmental impact, and can be raised close to large markets. However, due to a temperature restricted growing season it is essential that prawn production rates (pounds/acre) be maximized. Studies have shown that as territorial animals, the major constraint on prawn production is the amount of two dimensional space available per animal. Three objectives were addressed during Year 1. Objective 4.) Determine the effects and interactions of prawn stocking rate and the availability of substrate on prawn production. Objective 5.) Evaluate the economics of production and marketing of freshwater shrimp. Objective 6.) Evaluate different marketing strategies, market potentials, and distribution strategies and methods for different product forms.

To address Objective 4 prawns were stocked into 0.1 acre ponds at 16,000/acre without substrate (control ponds), 24,000/acre with and without substrate, and 48,000/acre with and without substrate (five treatments with three replicate ponds per treatment). Available surface area was increased approximately 80% in each pond. Each pond was supplied with full-time aeration.

There was no significant difference in survival which averaged 77%, overall. Control ponds (16,000/acre without substrate) had the lowest production (772 lbs/acre) and poorest feed conversion (3.2) but high average weight (27 g). Increasing density to 24,000/acre significantly increased production (995 lbs/acre) without significantly decreasing prawn size (22 g). Adding substrate at this density did not produce statistically significant differences from the same density without substrate. However, compared to control ponds production was significantly greater (1,063 lbs/acre), feed conversion ratio (FCR) significantly lower (2.4), without a significant decrease in average size (28 g). In prawns stocked at 48,000/acre without substrate total production was significantly greater (1,219 lbs/acre) than 16,000 or 24,000/acre without substrate but average size was significantly lower (18 g) than in 16,000 or 24,000/acre with substrate. Adding substrate to high density ponds produced a significant increase in production (1,552 lbs/acre) without decreasing average size (18 g). Adding substrate produced no statistically significant changes in population structure within densities.

Addition of substrate to ponds stocked at 24,000/acre produced only a 7% increase in production, but a 25% increase in average size, and a 17% improvement in feed conversion. In ponds stocked at 48,000/acre addition of substrate increased production 27% without decreasing average size. Compared to previous recommended culture practices (16,000/acre without substrate), increased stocking rates 24,000 with added substrate increased production 38%, feed conversion efficiency 25%, and the number of harvestable (> 20 g) shrimp by 47% and premium shrimp (> 30 g) by 41%.

To address Object 5 a survey of distillers in mid-west is in process this Fall exploring the volume and cost of post-distilled grain as a feed additive for Kentucky shrimp. Preliminary cost estimates vary, but range between $100-150 per ton. Grain access and quality issues are currently being explored with local distillers.

To address Objective 6 a consumer test market survey was initiated by Dr. Tim Woods of the University of Kentucky. Consumers collectively ranked the features in the following importance based on their average response:

Taste	6.5
Fresh versus frozen	5.8
Cost	5.1
Medium size	5.0
Large size	5.0
Grown in Kentucky	4.8
Point-of-purchase materials	4.5
Bourbon mash feed	4.0
Uniform in size	3.8
Peeled	3.6
Pre-packaged	3.3

A more detailed analysis is underway to correlate attribute importance to the demographic data provided. This information will serve as input for a more rigorous conjoint analysis that will be completed in 1998. Results from these studies together will be used to support recommendations for market development strategies.

Project duration
2years

Budget:
SARE $155,197
ACE
Matching $162,728

SARE
Sustainable Agriculture Research and Education
Southern Region

AS93-8
LS94-64
Final Report
December 1997

Development of Suitable Area-Wide Weed Management Practices for Improved Land Utilization

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Musk thistle, an introduced plant, is a noxious weed that impacts land utilization over a broad geographical region. This weed grows in many areas that are inaccessible and uneconomical for herbicide use or mowing. A multistate project to develop and integrate a sustainable weed management program incorporating the release and establishment of two introduced thistle-feeding biological control agents was conducted with cooperators from Georgia, North Carolina, Tennessee, and Virginia. This multi-disciplinary (entomology, agronomy, and agricultural economics), multi-institution/agency (North Carolina Department of Agriculture, Tennessee Department of Agriculture, Tennessee Department of Transportation, University of Georgia, The University of Tennessee, and Virginia Polytechnic Institute and State University), and multi-state (Georgia, North Carolina, Tennessee, and Virginia) project involved research and extension entomologists, agronomists, agricultural economists, numerous grower and state organizations, and farmers.

Objectives

This regional project emphasized farmer education and the functional integration of research technology for implementation of sustainable management of musk thistle into ongoing farm systems. The overall goal of this project was to develop and integrate a sustainable weed management program that incorporated the release and establishment of two introduced thistle-feeding biological control agents. These two agents feed specifically on thistle and pose no threat to agricultural crops. These biological control agents have been evaluated, and are established, in Virginia, where they effectively provide sustainable control of musk thistle. Research knowledge from previous studies in Virginia was transferred and developed into a practical, integrated sustainable management program for surrounding states. Once developed, this program can be easily adapted by personnel in other states for sustainable management of musk thistle. The specific objectives of this proposal were to: 1) establish and maintain on-farm field insectaries in Georgia, North Carolina, Tennessee, and Virginia for propagation of two introduced thistle-feeding biological control agents, 2) develop a distribution plan to provide biological control agents to landowners and agencies for release in thistle-infested areas, 3) develop and implement a regional educational program (through grower education days, field days, county meetings, publications, etc.) to improve public awareness of sustainable management systems using this program as a model [the educational program will be directed at numerous targets including farmers, landowners, schools, organizations, and state and federal agencies], and 4) assess the economic and environmental benefits of this type of sustainable weed management program.

Approach

During this project, more than 200,000 biological control agents (i.e., two types of plant-feeding weevils) were collected and redistributed on farmland and other musk thistle-infested lands in Georgia, North Carolina, Tennessee, and Virginia. More than 130,000 head weevils, *Rhinocyllus conicus,* and ca. 72,000 rosette weevils, *Trichosirocalus horridus*, were released into thistle-infested areas. In many of these areas, populations became established, reproduced, and moved into other thistle-infested areas. In addition, plant-feeding weevils were provided to cooperators in other states.

During the final year of this project, about 50,000 biological control agents were released against musk thistle at locations in Alabama, Georgia, North Carolina, Oklahoma, Tennessee, and Virginia. About 17,550 head weevils and 6,100 rosette weevils were collected and redistributed on thistle-infested farmland in Tennessee. Approximately 1,100 head weevils and 900 rosette weevils were collected in Tennessee and released on farmland in North Carolina. During 1997, 3,850 head weevils were collected in Virginia and released in Alabama, Oklahoma, and Virginia; 15,000 rosette weevils were collected in Virginia, and provided to cooperators in Oklahoma and Virginia. Head weevils (ca. 5,500) were collected and redistributed in Georgia. In 1997, weevils were released at 18 sites in 13 counties in Georgia, in 4 counties in North Carolina, at about 110 sites in 14 counties in Tennessee, and at several sites in 4-5 counties in Virginia. On-farm and off-farm demonstration sites and

Project duration
4 years

Budget:

SARE	$3,760
ACE	$161,240
Matching	$133,000

field insectaries were established and maintained in Georgia, North Carolina, and Tennessee. Two field insectaries also were maintained in Virginia for propagation of biological control agents.

Throughout this regional project, goals were outlined and discussed with numerous county extension agents and farmers, as well as at various grower meetings, field days, and scientific meetings. Cooperators worked closely with county extension agents and farmers to coordinate releases and to keep interested individuals informed of the status of the project. Because this program was relatively new to Georgia, North Carolina, and Tennessee, much continued effort was placed on contacting and explaining this project to county agents. Additional cooperators were aligned and field insectaries were designated. Information on this sustainable weed management program was distributed through various media outlets (e.g., letters, publications, field days, grower meetings, "Weevil Roundups/Rodeos", radio and television programs, and professional meetings).

As part of the educational component of this project, "Weevil Roundups/ Rodeos" were held each year in several counties in Georgia, North Carolina, and Tennessee. These activities, held on grower cooperator farms, were developed in cooperation with county agents. Farmers, other interested individuals, and several extension agents from other counties attended these field demonstrations. Participants received "hands-on" experience related to weevil identification, as well as identification of the types of damage caused by these biological control agents and a general overview of this sustainable program. The goals of this project were outlined, and questions were answered. At the conclusion of the program, participants received and/or could collect weevils to redistribute into other thistle-infested areas.

This environmentally safe and economically sound management program is expected to provide environmental, economical and social benefits. These include reduced herbicide use, improved pasture management, improved water quality, improved land value, reduced fossil fuel and labor costs, reduced impact on non-target organisms, reduced risk of exposure to herbicides, reduced herbicide residues, and reduced costs of weed management (e.g., in Missouri and Virginia, management agencies and farmers save from $750,000 to $1,000,000 annually in reduced herbicide use compared to previous conventional practices). Reducing musk thistle populations to lower levels will lead to an increase in available pasture and crop lands. Valuable efforts expended to control musk thistle could be allocated more effectively and efficiently on crop or livestock production. Establishment of this biological control system should provide a self-perpetuating, sustainable control system capable of being implemented over wide areas. This project should also reduce environmental pollutants, thereby protecting the environment and natural resources. Management of weeds, such as musk thistle, using sustainable systems will demonstrate a positive approach to the current global concerns over environmental and groundwater contamination by pesticides.

Results

Once established, these biological control agents can significantly impact populations of musk thistle. For example, densities of musk thistle have decreased dramatically (ca. 97%) in Tennessee since 1989 when initial large-scale releases were initiated. Similar reductions have now been observed in Georgia and North Carolina. In some areas in Tennessee, densities of musk thistle were too low to enable collections of head and rosette weevils. These low populations of musk thistle are a direct result of the impact of these biological control agents, which are well established in eastern Tennessee, and efforts are underway to enhance their establishment and distribution in middle Tennessee. The average number of seeds produced per plant also has been reduced. As the number of seeds decline, the available seed bank in the soil should also decline. Data suggest that the number of musk thistle plants and the number of seeds available in the soil are decreasing as a result of this project. As plant populations decline, fewer monumental efforts will need to be initiated to manage musk thistle over a large area. This decline in musk thistle should result in economical and environmental savings to farmers and other landowners. For example, Tennessee Department of Transportation estimated that they saved about 1-2 million dollars as a direct result of this project. The economic savings to farmers also is high, estimated at $500,000 to $1,000,000 in Tennessee. A survey is underway to further evaluate the potential economic savings to growers in Tennessee. These plant reductions also should enable farmers and other land managers to better utilize their land. Future efforts will continue to focus on the redistribution of both species and on the education of growers and the public on integrated management of thistle weeds using biological control.

Impact of results

These two biological control agents contribute to sustainable control of musk and other exotic thistle pests. Using these two thistle-feeding weevils, farmers and landowners can better manage thistles in a nontoxic, nonpolluting manner that is sustainable. In addition, once established, the control agents disperse to attack thistles in adjoining areas. In many locales, such as the mountains, farmers cannot get equipment into their fields or they cannot afford to mow or spray thistles. This biological control program gives these farmers thistle reduction in the areas that may need it most. Successful sustainable management of musk thistle using biological control should enable farmers and other land managers to better use their land, redirect their resources, better utilize their time and labor, and improve productivity of their lands. Thus, a successful program would have tremendous economic and environmental impacts throughout a region. In addition, populations of *R. conicus* have not been shown to have much, if any, impact on nontarget plant species in these states. Nontarget plants will continue to be monitored to evaluate potential impact caused by *R. conicus*.

Potential contribution

This program has demonstrated the effectiveness, ease of adoption and incorporation, and economic and environmental benefits of an integrated biological control program for successful area-wide sustainable management of musk thistle. This program also contributed to education of farmers and the general public as to the benefits of this type of program. Its success and educational benefits should encourage more use of biologically sustainable programs in these and other states.

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AS93-9
LS93-56
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Using Soldier Flies as a Manure Management Tool for Volume Reduction, House Fly Control and Feedstuff Production

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Objectives

The overall objective is to develop a system to manage a native nonpest soldier fly larvae (SFL) to; (1) reduce manure accumulations where livestock is housed, (2) eliminate house flies and (3) produce tonnage of high quality feedstuff. Currently this system is being developed for caged layer houses and specific objectives are:

1.) Determine depth of manure basin necessary to allow SFL to utilize manure accumulated during the previous winter.

2.) Characterize plant nutrients in layer manure with and without SFL.

3.) Evaluate manure volume reduction, esp. of winter accumulation.

4.) Evaluate SFL feedstuff production, quality and utilization.

5.) Determine feasibility of using this system in high-rise layer houses.

The black soldier fly (*Hermetia illucens*) occurs worldwide in the tropics and temperate regions. The larvae of this large, wasp-like fly occur in very dense populations on various organic wastes and excludes other flies. We are developing a manure management system for caged layers using soldier fly larvae (SFL). In our system, wild populations of SFL are managed in concrete basins under the hens (could be hogs or cattle) to:

1.) Eliminate house fly breeding.

2.) Eliminate half of the manure through incorporation into larval biomass.

3.) Produce large quantities of high quality feedstuff (42 percent protein, 35 percent fat) through *self-harvest* of prepupae (ca. 65 tons/ 100,000 layers annually). SFL convert manure to "meat" about as well as hogs convert their feed.

This system will greatly reduce manure handling and pollution potential and increase feedstuff production. This contribution of high quality feedstuff could be a huge benefit to the livestock industry, especially if world menhaden (fish meal) stocks continue to decline. Twenty-three thousand tons of dried larval feedstuff with a minimal value of $7 million could be produced in the Georgia layer industry each year. If adapted to broilers and swine, over a larger geographic area this would be multiplied many times. Environmental benefits may be more valuable than direct economic returns.

Utilization of the larval feedstuff has been extensively studied. It has been successfully incorporated into the diets of poultry, fish and swine with hogs actually preferring a larvae based diet over a soybean diet. One of the most remarkable things about this system is that the larvae self-collect themselves. They do this as they are leaving the manure basin to transform into the adult. At this stage they are at their maximum size, with a large store of fat. This fat is to sustain them to adulthood, but is a valuable feedstuff. This stage does not feed. Considering their diet, this is a definite plus.

Approach

The 24-by-60-foot experimental caged layer house was completed and 1700 layers were installed in September 1994. About 41,000 SFL were released into the outer two pits (there are four pits) where they were managed. The inner two pits were sprayed with Larvadex® to eliminate any larval activity. Soldier fly activity had almost stopped when hens were installed in late September. The larvae that were released overwintered in the general area, emerged as adults in April and laid their eggs.

One main objective was to determine if SFL could digest the stockpiled, winter-accumulated manure. If this was successful it would have almost doubled the benefits of manure reduction and feedstuff production. In previous studies SFL had been successfully used to manage manure as it was produced in the warmer months of April to October.

Results

Unfortunately the deep, dry base of older manure caused two problems in 1995; failure of prepupae to exit the pit to self-harvest and a darkling beetle outbreak. Also, there was a house fly outbreak in the fall just after hens were introduced. None of these problems had occurred in previous studies with a spring manure clean-out and an established SFL population in-place through the fall and winter.

The commercial scale manure basin was ef-

Project duration
4 years

Budget:
SARE $2,150
ACE $49,100
Matching $25,626

fective in harvesting the prepupae that did attempt to exit, and manure clean-out was routine with a small Kobuto tractor with front-end loader.

In 1996, returning wild female soldier flies established a robust larval population soon after hens were installed on April 29. An ovipositing female survey at this house (one time count in the early afternoon) indicated an average of 52 present and ovipositing on each of 29 counts from May 7 to August 20. Assuming a residence time of 15 minutes (true residence time unknown) and an active oviposition period of five hours, then 1040 females would oviposit daily.

Given an average mass size of 998 eggs, then over a million eggs would be laid daily to digest the manure of the 1900 hens. Given a residence time of two months per larvae, a population of about 60 million would develop. .All of this oviposition is from a wild population residing around the manure management facility. House flies were controlled, and no lesser mealworms developed in pits where soldier fly larvae were allowed to establish.

Analysis indicated that plant nutrient amounts were about the same in manure digested by soldier fly larvae as in undigested manure. The four-foot-high, 40-degree ramp for prepupae self-harvest did not allow the same rate of collection as previous designs. This flaw was not evident in the low collections of 1995.

Three problems became evident in 1996: 1) height was excessive–two and a half feet would be sufficient, 2) 40-degree angle was marginal. It should be less, and 3) rough texture on ramp was a mistake. It should be smooth so climbing prepupae do not turn over and roll back down the ramp.

In 1997, new collection ramps were installed that are lower and smoother to optimize prepupal collections—slopes were built to a height of 29" at a 35 degree angle. No pits were treated with larvicide since these pits seemed to be acting as an "egg sink"; attracting ovipositing females, but producing no larvae.

In 1997 returning wild female soldier flies again established a strong larval population. Lesser mealworms were not a problem as they had been last year. Timing the annual clean-out in spring would maintain control of these pest beetles. Larval collections with this modification were good, and construction will be more economical.

	Newton & Sheppard	Rodriguez-Serna
Av. final wt.	48 gm (90d)	112 gm (175d)
Av. gain/day	.227 g (90d)	.298 g 56 days .626 g 175 days
Feed dry matter/gain	3.38	2.55 (56d) 3.79 (175d)
Feeding rate (to body weight on dry matter basis)	2%/day	8.6% begin 3.6% ending/day

Bull frog experiment

Bull frogs were reared on a diet of self-collected live soldier fly prepupae and catfish pellets in a system patterned after commercial frog production in Latin America. In the Latin American system, house flies are cultured at some expense on dairy by-products. By using soldier fly larvae, our live feed is a by-product of manure management. This is our second year raising frogs from tadpole to adult on this diet. Dr. Larry Newton has been the lead in this research. The above chart is a data summary comparing our rearing to that of a Mexican frog-culturist:

Given our low feeding rate, general lack of experience in this area, and use of a wild strain of frog, these results seem encouraging. Use of a strain of frog adapted to captivity would probably enhance growth greatly. Also, we only fed three days a week.

Greenhouse experiment

Soldier flies were colonized briefly in a greenhouse. Two thousand prepupae were placed on August 30 and the first emerged adult was seen September 9. First chasing (males after females) and mating was seen on September 13. On September 15 a female was seen in the media bucket with ovipositor extended, but no eggs were found. First eggs were deposited September 16 (these were fertile). Twenty-five egg masses were collected on September 17; also much chasing and mating on September 17. Forty-seven egg masses were collected on September 19. Adults were never seen to feed, but did go to cool-cells (wet cooling pads) to get water. Pig weed that had volunteered on the greenhouse floor was a favorite resting site. Maximum numbers of adults ever present was estimated to be 75 on Sept. 16. This dwindled to four on October 1. Soldier flies exhibit a very extended and variable time to emerge and a few adults continued to appear into February. Mass culturing for initiating new populations for waste management seems feasible.

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AS93-11
AS94-11.1
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Use of Poultry Litter or Manure for Root-Knot Nematode Management on Vegetables and Field Crops

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Project duration
4 years

Budget:

SARE	
ACE	$146,696
Matching	$109,000

Objectives

Poultry is a large agricultural industry in the southeastern United States. The poultry industry generated an estimated income of $480 million in South Carolina and $1.5 billion in Georgia during 1994-1996. In addition to providing income and food products, the industry generated an estimated 3 million tons of waste annually in South Carolina and Georgia. Although poultry is a significant economic component of agricultural income in the southeastern United States, it also presents a significant challenge to manage and utilize the waste that is generated. Poultry manure contains significant quantities of fertilizer [Nitrogen (N), Potassium (K) and phosphorus (P) and micronutrients]. Application of litter or manure to land has been viewed as a substitute for mineral fertilizers and as a method for disposing of unwanted waste. The N, P and K components in the manure are equivalent to an estimated $61 million of inorganic fertilizer.

Root–knot nematodes, a debilitating plant root parasite, are common in southern soils and are a serious problem on vegetable and field crops. On just two row crops in South Carolina (cotton and tobacco) an estimated $10 million are spent annually on nematicides to control nematodes, whereas in Georgia an estimated $54 million are spent annually to control nematodes on cotton, tobacco and peanuts.

As a result of widespread infestations of root-knot nematodes, nematicides are commonly used in many cropping systems with the potential of contaminating surface and ground water. Nitrogen-rich organic amendments can be used to suppress root-knot nematodes and may provide an alternative to synthetic pesticides.

The specific objectives are to:

1.) Determine if poultry manure or litter (which form is best) can be used, at environmentally sound application rates, to provide fertilizer (N, P, K and micronutrients) for a crop and suppress nematodes.

2.) Determine if the nematode suppression is due to the ammonia in the manure and litter or to organisms in the manures.

3.) Encourage the farm community to utilize this valuable resource.

Approach

Poultry litter and manures were collected from several collection systems and found to vary in the percent of total nitrogen as ammonia, one component believed to influence root-knot development. Organic soil amendments (poultry litter and three types of poultry manure) were evaluated for suppression of root-knot nematodes on field grown summer squash cv. Goldbar. Organic amendments or fertilizer were added to soil, incorporated with a power driven rotary hoe, and the rows covered with plastic mulch. Plots were irrigated as needed through trickle tubing. Fertilizer or manure provided comparable quantities of inorganic nitrogen when application of manure was based on 60% of organic nitrogen and 80% of ammonium nitrogen being available to the crop (1993, 1994, 1996). Root galling was lower (1993, P= 0.05) in plots receiving litter amendments when compared to inorganic fertilizer applications. Poultry manure and litter amendments resulted in squash yields comparable to yields in plots treated with inorganic fertilizer. Nematode damage was light in 1994 and 1996 and may be due in part to the short growing season of squash (45 days to first harvest).

The effects of poultry litter and associated microorganisms on the cotton cultivar DPL50 in litter amended soils were investigated in the greenhouse and in field studies. Root -knot nematode numbers decreased in poultry litter amended treatments. Bacterial, fungi and free living nematodes were increased. Negative linear relationships were observed between nematode numbers and bacterial and fungal numbers. Poultry litter apparently stimulates microbial activity in the soil that is antagonistic to plant parasitic nematodes. Further studies found that poultry litter and manure application decreased root-knot numbers when nematodes were applied as infected root pieces but not as eggs, egg masses or juveniles.

Ammonia (NH_3) released from litter and manure is another factor that may be detrimental to root-knot nematodes. Over a 14 day period 32.9%, 40.3%, 62.6%, and 50.1% of the total N

was volatilized as NH_3 from litter, high-rise, belt and chain manures, respectively. The NH_3 generated remains as NH^3 as long as soil pH remains high.

Application of poultry manure and litter significantly increase soil pH shortly after application. Soil pH rose from 5.63 to 8.29 units within 48 hours when manures were added to soil at a rate of 360 kg of N/ha. This soil pH is sufficient to maintain the N in the NH_3 form.

The ability of poultry litter or manures to reduce root-knot disease will enhance the value of these agricultural wastes increasing there acceptance into integrated production systems. The successful adaptation of manure or poultry litter, as a nematode suppressants, depends on the economic benefits from the application of the manures balanced by the increased cost of transportation.

A comparison of fertility costs between farms spreading poultry litter at the rate of two tons per acre and farms using all commercial fertilizer indicates a slight cost advantage to spreading litter on corn and double-cropped soybeans/wheat. Individual producers with surplus on-farm labor could realize greater cost savings by spreading litter. Conversely, producers without the equipment to efficiently handle the litter could see higher labor costs that eliminate any cost savings from applying poultry litter to their crops.

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Assessing the Impact of Beneficial Insect Populations on Organic Farms

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Although organic farmers rely heavily on beneficial insects to control pests, little is known about the impact of naturally-occurring beneficial species or the need for supplemental releases of purchased parasitoids and predators to control pests. This research project was undertaken to provide this information and had as its objectives:

Objectives

1.) Identify species of natural enemies present in organically grown tomatoes.

2.) Characterize the seasonal patterns of abundance for important natural enemy species.

3.) Identify the important prey or host species for these natural enemies.

4.) Document the impact of naturally occurring biological control on populations of key pest species.

5.) Measure the impact of releases of commercially purchased lacewings and *Trichogramma*.

Approach

Replicated research plots were established on 4 commercial organic farms located in the Piedmont and Coastal Plain of North Carolina. Each of the farmers followed their normal practices throughout the season. Plots were sampled at least weekly at each site. Spring plantings were sampled at all locations in both 1995 and 1996, whereas fall plantings were sampled at 2 sites in both years.

Plants were visually inspected for the presence of pest and beneficial arthropods. Blossoms were collected to sample flower thrips. Lepidopterous eggs and larvae were counted, collected, and held to determine parasitization and for species identification. Aphids were counted and collected to monitor levels of parasitism and to identify parasitoid species. In addition, the impact of natural enemies on pest populations was investigated in greater detail using a natural enemy exclusion procedure for aphids and by placing clusters of fruitworm eggs in each plot to monitor parasitization and predation on fruitworm eggs. The impact of releases of commercially purchased *Trichogramma* was addressed by comparing levels of fruitworm egg parasitism at the release sites prior to and following the releases and by carrying out quality control tests on *Trichogramma* purchased from 12 companies.

Results

During both years, biological control by naturally-occurring insect parasitoids and predators was very important in the suppression of insect pest populations in organic tomato production. In particular, egg parasitism of both hornworm eggs by *Trichogramma* spp. and *Telenomus sphingis*, and of fruitworm eggs by *Trichogramma* spp. was generally high and at times approached 100 percent. These high levels of egg parasitism, in combination with egg predation, primarily by green lacewing larvae and lady beetles, appeared to play an important role in making organic tomato production an economically viable enterprise. Larval parasitism was less significant, because it was lower and highly variable, and because it did not prevent the larvae from damaging the plants and fruit.

Commercially purchased *Trichogramma* were of poor quality. Releases of commercially purchased *Trichogramma* had mixed results. In 3 of the 6 releases made over both years, no observable change was seen in the incidence of egg parasitism.

To the extent that the *Trichogramma* purchased for this study are representative, and high levels of egg parasitism are typical on organic farms, the benefits of releasing purchased *Trichogramma* for control of tomato fruitworm are unpredictable. Our findings clearly identify a need for improved quality control measures by the companies selling *Trichogramma*. To effectively use *Trichogramma* releases for insect control, farmers will require a source of high quality *Trichogramma* and a knowledge of how the parasitism levels change over the season.

Naturally occurring biological control of aphid populations was also important in restraining aphid populations. It reduced the rate of population growth rather than causing a decline in population size. Its importance varied locally within fields. Both plant condition and rainfall seemed to be major factors in the decline of aphid populations. These results suggest that one or more well-timed releases of aphid predators (e.g. green lacewings) could prove valuable in preventing the development of damaging aphid populations in organic tomato plantings.

Project duration
3 years

Budget:

SARE	$17,735
ACE	$37,207
Matching	$14,068

Impact of results

The findings presented in this report will equip organic farmers with information required to determine the value of releasing purchased parasitoids and predators to control tomato fruitworm, hornworms, and aphids. The results will also provide the first thorough documentation of the impact of naturally-occurring biological control in organic tomato production in the Southern Region. As such, it will help to identify the level of biological control that can be obtained when conventional production practices are modified to accommodate the important biological control agents.

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Southern Region

AS94-14
Final Report
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Forage, Biomass and Biogas Integrated Systems for Animal Waste Management

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Alternative outlets for animal waste disposal and recycling must be developed to reduce the waste stream and result in sustainable use of nutrients. This project is studying an integrated biomass and biogas energy production system as a tool for managing animal wastes.

Objectives

1.) Determine nutrient removal from the waste stream via energy production and nutrient fate when land-applied to switchgrass.

2.) Determine total energy production from an integrated biogas-biomass system.

3.) Examine the economics of the system and components including environmental impacts.

Approach

The biogas digester system components have been designed, installed, and tested. Biogas generation and utilization is anticipated in January 1998. Large plots of switchgrass were instrumented at the Texas A&M University Agricultural Research and Extension Center at Stephenville. Dairy waste was applied to the plots to determine nutrient removal in biomass, residual nutrients in the soil, movement of nitrate-nitrogen in soil water and nutrients in surface runoff water.

Results

During 1996 and 1997 Alamo switchgrass biomass increased with increasing nitrogen rate to a maximum of seven tons per acre at 518 and 572 pounds effluent-source nitrogen per acre in respective years. Less than one-fourth of the applied nitrogen and one-third of the concurrently applied phosphorus was removed in the biomass during 1996 and 1997. At the highest effluent rate 0 to 6-inch soil test phosphorus increased from 25 pounds per acre initially to 87 pounds in 1996 and declined slightly in 1997. Soil phosphorus in the 0 to 6-inch depth of the untreated switchgrass filter strip remained at initial levels after application of up to 210 pounds phosphorus in the upslope treated area. Nitrate-nitrogen and phosphorus content of water collected at 39 inches soil depth in the treated area was greater after heavy rainfall and increased with increasing effluent rate to about 4 parts per million. Both the nitrate-nitrogen and phosphorus content of water collected at 18 and 36 inches on ten dates in 1997 averaged less than 1 part per million. Runoff nitrate, phosphorus, and chemical oxygen demand were significantly reduced by passing through the filter strip.

The most important findings of the first three years of this study are that using dairy waste for land application to switchgrass for biomass production can produce seven tons per acre of biomass and switchgrass filter strips can significantly reduce concentration of pollutants in the surface runoff water. Leaching of both nitrate-nitrogen and phosphorus is becoming a cause for concern and further soil water quality monitoring is indicated.

Project duration
3 years

Budget:
SARE
ACE $101,180
Matching $157,894

SARE
Sustainable Agriculture Research and Education
Southern Region

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Development of Guidelines for and Demonstration of Efficient Treatment of Swine Lagoon Wastewater by Constructed Wetlands

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Project duration
4 years

Budget:
SARE $130,325
ACE Matching $78,552

Animal waste management practices are under scrutiny by the public and by state and federal agencies because of their potential impact on the environment. The public perceives and associates water quality problems of streams and lakes as being caused by irresponsible farming practices.

Excessive application of animal manures on crop and pasture lands is generally implicated as a major source of non-point source pollution of streams and lakes. Odors associated with animal manures have hindered expansion and new startups of confined animal operations, especially swine operations. Also, there have been comments associating foodborne disease outbreaks with unsanitary conditions and improper management and disposal of animal manures on livestock farms.

Swine production facilities have been the focus of much criticism in recent years. Odors and the potential for water contamination are cited as problems of such operations. Many swine production facilities employ liquid waste management systems with lagoons as low cost, temporary waste storage structures. The liquid waste must be spread on land periodically to avoid overflow of lagoons, and during land application, manure odors are particularly evident. Alternative liquid animal manure management systems need to be explored which can reduce the impact of the waste on the environment and which permit sustainability of swine and other livestock production enterprises.

Constructed wetlands were first used in Europe and Scandinavia as an affordable alternative to municipal wastewater treatment systems. The technology has been proven to be highly successful for treatment of municipal wastewaters, and this has stimulated interest to apply this technology to the treatment of liquid manures such as liquid swine manure in lagoons.

Some of the perceived benefits of using constructed wetlands for the treatment of swine lagoon wastewaters are : 1) low cost of construction, 2) low operation cost, 3) highly efficient process, 4) the process is natural, and low technology, 5) low mechanization, and 6) good potential for controlling odors. It appears that constructed wetlands are well suited for use on livestock farms for the treatment of large volumes of wastewater at a nominal cost. To demonstrate the use of constructed wetlands for the treatment of swine lagoon wastewater, a project was initiated in Alabama with the following project objectives:

Objectives

1). Develop guidelines for efficient operation of constructed wetlands for bioremediation of swine lagoon wastewater.

2). Determine impact of wetlands treating swine lagoon wastewater on groundwater quality.

3). Demonstrate efficient swine lagoon wastewater treatment by wetlands to regulatory agencies and to area livestock producers.

Approach

The wetland system was constructed at the Sand Mountain Agricultural Experiment Station at Crossville, Alabama in the late Fall of 1988. The system was designed according to criteria from the Tennessee Valley Authority for constructed wetlands treating municipal wastewater. A one-acre wetland was built with five, 0.1 acre (26 feet wide X 164 feet long) wetland cells in the upper tier and five cells in the lower tier. The total wetland area is 1 acre which treats all the manure from a 500 market hog/year operation. The wetland cells were planted with emergent aquatic plants in the Spring of 1989 with cattail, soft-stem bulrush and common reed as the predominant aquatic plants.

The plants were cultivated for two growing seasons before swine lagoon effluent was treated in the wetland cells. Because animal manure lagoon effluents contain high ammonia levels which can be toxic to plants, the lagoon effluent was first diverted through a shallow 0.25 acre mixing pond to allow dilution of the wastewater, if necessary, before the lagoon effluent entered the wetland.

Constructed wetlands work best when animal manures are diluted and some particulate matter is removed prior to the wastewater entering the wetland system. This can be accomplished by water flushing the manure out of livestock production facilities into a two-stage lagoon system where some treatment and settling of particulates

occur. Effluent from the secondary lagoon can then be treated in wetlands much more efficiently.

This type of wetland treatment system was monitored at two-week intervals for 57 months at a Biochemical/ Biological Oxygen Demand (BOD_5) loading rate of 4 lbs BOD/acre/day. At this loading rate to the wetland system the wetland effluent had less than 10 ppm total ammonia-nitrogen (NH_3+NH_4-N), less than 30 ppm of total suspended solids (TSS) and less than 30 ppm of BOD_5 as recommended by the USDA/Natural Resource Conservation Service (NRCS). There has been no impact on groundwater quality during the wetland study.

A more recent study conducted at the Crossville, Alabama demonstration site evaluated three BOD_5 loading rates to verify the 4 lbs BOD/acre/day loading rate determined previously was on target or if the wetland loading rate could be increased without impairment of wastewater treatment efficiency. The three BOD_5 loading rates (5.2, 7.1, and 11.7 lbs BOD/acre/day) were monitored for 23 months.

At the low loading rate (5.2 lbs BOD/acre/day) the wetland outflow had 14.7 ppm of total ammonia-N, 9.5 ppm BOD_5, and 25.1 ppm of TSS. Both BOD_5 and TSS were within the USDA/ NRCS guideline of less than 30 ppm, and total ammonia-N only exceeded the guideline by 4.7 ppm.

Results

These results indicate that a wetland loading rate of 4 to 5 lbs BOD_5/acre/ day will permit sufficient wastewater treatment to achieve USDA/NRCS suggested wetland effluent guidelines for TSS, BOD and total ammonia-N. At this wetland BOD_5 loading rate about 7,700 gallons of lagoon effluent can be treated daily with a one acre wetland.

Mass loading of TKN and BOD_5 into the wetlands was reduced 67.8% and 83.3%, respectively, with 1.8 lbs of TKN and 0.85 lbs of BOD_5 exiting the acre wetland daily. This degree of wastewater treatment may be viewed as unnecessary because the treated wastewater cannot be discharged without a regulatory permit.

However, water that is treated to meet wetland effluent discharge criteria of government agencies may be interpreted to be safe to be used to flush manure from swine production facilities. Water treatment to achieve water suitable for use in swine production facilities must eliminate odors and practically eliminate potential hazards from enteric pathogenic bacteria.

Studies at the Crossville, Alabama demonstration site with wetland effluent recycled for use as flush water for cleaning swine farrowing and nursery houses, have demonstrated that recycled water had average TKN, total ammonia, and BOD_5 concentrations of 7.7, 2.2, and 13.8 ppm, respectively, that meet Georgia Department of Natural Resources guidelines for effluent discharge from constructed wetlands treating municipal wastewater.

The Georgia guidelines require the effluent to not exceed a BOD_5 of 20 ppm and 5 ppm NH_3-N during May to October which is during the Summer and Fall when wetland treatment efficiency is highest. Treatment of swine lagoon wastewater to these final effluent treatment criteria eliminates odors and substantially reduces levels of nutrients and fecal coliform bacteria.

The final effluent can be applied to land or recycled for cleaning swine production facilities, thereby reducing the impact of the lagoon wastewater on the environment and also contributing to the sustainability and profitability of swine production enterprises.

Impact of results

The benefits of constructed wetlands have been demonstrated and discussed with regulatory agencies and area livestock producers on several occasions. Researchers, regulatory agency personnel, producers and laymen have toured the wetland site to see the wetland design in operation.

Wastewater treatment efficiency relative to quantity of waste treated by constructed wetlands and the advantages of using constructed wetlands systems have been discussed. Individuals are able to assess the system given the information on the effectiveness of the wetland system for wastewater treatment.

On several occasions seminars at research and technical meetings have been given to agency personnel, researchers and producers to convey the success story for this constructed wetland system. Such situations have also created an open forum to discuss the potential pitfalls and future of this technology for environmentally sound livestock waste management. A handbook of guidelines for treating swine lagoon wastewater by constructed wetlands is forth coming, once the information from the current research is compiled.

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AS95-19
Annual Report
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Biological Control Methods for Citrus Rust Mites and Spider Mites on Florida Citrus Utilizing Predaceous Arthropods as Part of IPM

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Objectives

1.) Determine the seasonal occurrence and distribution of *Agistemus floridanus* (Acari: Stigmaeidae) and other predaceous arthropods within individual trees in seven selected commercial citrus grove sites located in central and south Florida for one year.

2.) Identify important weed (ground cover and vine) plants within the citrus groves that contain *A. floridanus* or other prevalent species of predaceous arthropods during the year. Determine when specific ground cover plants are flowering within each selected grove site. Determine if there is seasonal or vertical movement of predaceous mites or insects between citrus and ground cover vegetation or vines within the groves.

3.) Determine the life table parameters of *A. floridanus* and other selected prevalent predators including developmental rates, reproductive potentials, and number of female progeny produced per adult female in the laboratory when provided with citrus rust mite as the food source.

4.) Determine comparative toxicities of all registered pesticides (including insecticides, miticides, fungicides and herbicides) used in the Florida citrus industry at recommended and reduced field rates against *A. floridanus* populations and one or more other selected prevalent species of predaceous mites or insects based on results from Objective 1.

5.) Establish experimental citrus grove sites with other farmers previously on chemical mite control programs and implement augmentative infestations of selected predaceous arthropod species and ground cover plants (if appropriate) and modify spray programs to minimize toxicity to the selected predators. Continued monitoring of these sites will be completed during years two and three of the project to establish successful biological control of the targeted mite species and fine tune the methods.

Approach

Seven citrus grove sites on either a no spray or modified spray program were identified and intensively sampled over an 18 month period to identify the complex of predacious arthropods associated with citrus rust and spider mites on Florida citrus. None of these grove sites applied a miticide during the sampling phase. Except for the Yarborough site, none of the other grove sites received a miticide application in recent years.

Several research objectives were developed to provide a clearer understanding of the key mite and insect predators and their potential use on Florida citrus to regulate citrus rust mite and spider mite pest species rather than existing practices of sole reliance on chemical control tactics.

Results

Objective 1: To date, over 24 species of Phytoseiidae, 2 species of Stigmaeidae, 10 species of Cheyletidae, 7 species of Tydeidae, 2 species of Cunaxidae and one predacious thrips species have been identified from the extensive series of slide-mounted arthropods collected from these grove sites. This list will be substantially increased over the next few months.

Objective 2: A total of 77 species of cover crop plants have been identified and 59 of these had one or more species of Phytoseiidae present. This clearly indicates that vertical movement of these predators occurs in Florida citrus grove sites since the same species are found within the tree canopies too. Clear indications of differences between Stigmaeidae and Phytoseiidae numbers were found where herbicide usage occurred compared with where herbicides were not used in different grove sites.

Objective 3: Several phytoseiid mites and two species of stigmaeid mites have been shown to feed on citrus rust mites. Specific stages of the citrus rust mite that were eaten were identified for each of these exotic or native predacious mite species. Results of these studies indicate that most of the phytoseiid species will not feed and reproduce when provided with only citrus rust mites as a food source. Life table analysis remain incomplete for Agistemus floridanus and Agistemus industani when provided with only citrus rust mite compared with this eriophyid mite in combination with other food sources.

Objective 4: A total of 24 pesticides were applied with an airblast sprayer in 250 gallons of water per acre in 6 series of experiments to de-

Project duration
3 years

Budget:

SARE	$75,000
ACE	$50,512
Matching	$100,000

termine comparative toxicities against one or two species of Euseius (Acari: Phytoseiidae). The prevalent native species, E. mesembrinus and an exotic species from Morocco, E. stipulatus were compared in the first two series of experiments. Thereafter, only E. mesembrinus was used to compare toxicities of the different pesticides.

Pesticides were rated as either highly toxic, toxic or slightly to non-toxic based on their overall effect on gravid adult females, subsequent egg production and surviving immatures. The following pesticides were considered highly toxic to gravid females of E. mesembrinus or (E. stipulatus): Series 1: Nexter 75WP at 6.6 oz (E. stipulatus), Series 5: Guthion 50WP at 4 lbs, Carzol 92SP at 1 lb, Micromite 25WP at 24 oz + 1 gallon of 435 petroleum oil, Dimethoate 400 at 5 pints, Malathion 5EC at 5 pints, Dicofol 4EC at 6 pints and Comite 6.55EC at 3 pints. Series 6: Carzol 92SP at 1 lb, Dicofol 4EC at 6 pints. The following pesticides were considered toxic to gravid females: Series 1: Nexter 75WP at 5.2 oz (E. stipulatus), Nexter 75WP at 6.6 oz, and Agri-mek 0.15EC at 10 oz + 5 gallons FC435 petroleum oil. Series 3: Ferbam 76W at 15 lbs and Benlate 50WP at 1.5 lbs + Ferbam 76W at 5 lbs. Series 5: Sevin 80S at 10 lbs and Sevin XLR at 2 gallons + 1 gallon FC435 petroleum oil and Series 6: Benlate 50WP at 3 lbs, Ferbam 76W at 15 lbs, Ethion 4EC at 6 pints + 5 gallons FC435 petroleum oil and Alert 2SC at 20 oz.

The following pesticides resulted in a significant reduction in numbers of eggs or immatures. Series 1: Agri-mek 0.15EC at 10 oz + 5 gallons petroleum oil and Nexter 75WP at 6.6 oz. Series 2: FC435-66 petroleum oil at 5 and 10 gallons (immatures of both Euseius species). Series 3:

Ferbam 76W at 15 lbs, Benlate 50WP at 1.5 lbs + Ferbam 76W at 5 lbs or Benlate 50WP at 3 lbs (reduction in eggs). Series 4: Nexter 75WP at 6.6 oz + 5 gallons petroleum oil (reduced eggs and immatures) and petroleum oil (FC435-66) at 5 and 10 gallons (reduced immatures).

Objective 5: [Modified objective]. Fruit and leaf counts of citrus rust mites and spider mites were significantly higher in all treatments that included one of two copper formulations in two different citrus grove sites during 1997. Data on the impact (if any) on tydeid mites and the predacious mite complex have not been completed yet.

This research needs to be repeated in 1998 to validate first year results. Field evaluation of different herbicide regimes on species composition of predacious mites and species shifts between predacious mite families is dictated based upon results obtained in objectives 1 and 2. This information is vital in identifying potentially disruptive problems with existing pesticide usage on Florida citrus including the impact of ground cover control.

Impact of results

The impact of this research will radically change control approach options for Florida citrus growers. Spin off benefits will be provided by identifying different potential predators for use in other cropping systems in southern agriculture. The potential contributions to Florida citrus growers will be new available tools to substantially reduce production costs and reduce pesticide usage on Florida citrus. These benefits will improve our competitive edge in citrus exports since production costs will be reduced. Consumers can benefit from lower prices, reduction in our dependence on chemical control of mites, and reduced potential risks of exposure to pesticide residues.

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Southern Region

AS95-21
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Reduced-Risk Cockroach Control in Confined Animal Production

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Central to the philosophy of integrated pest management (IPM) is the idea that treatment should be based on need. Yet, current cockroach suppression practices in both urban environments and swine production rely heavily upon multiple scheduled applications of broad-spectrum insecticides with little concern about pest population size. This is primarily due to lack of efficient detection and monitoring tools for cockroaches. Therefore, a major motivation of this project is to study the utility of cockroach pheromones in the implementation of IPM principles in managing cockroaches. The goal is the isolation, identification and synthesis of the sex pheromone of the Oriental cockroach.

Laboratory and field studies will evaluate the utility of these compounds for integrated cockroach management in swine houses. Integration of the sex pheromone with reduced-risk insecticide bait formulations, insect growth regulators and biological control agents will also be studied. Each component of the resulting reduced-risk pest suppression program will be demonstrated on a commercial farm. Reference and training materials (manuals, interactive computer, videos) on reduced-risk pest control techniques will be developed and made available to target audiences, including commercial producers (confined livestock and poultry) and county extension personnel.

It is anticipated that the long-term impacts of this project will include the following: Pheromones will reduce insecticide use, increase accessibility to pests that retreat into insecticide-free cracks and crevices, increase the efficacy of insecticides, serve as highly specific agents with negligible mammalian toxicity, permit the viability of reduced-risk biopesticide approaches such as biological control agents, reduce costs and will have a direct impact on the quality of worker health, the environment and swine production.

Objectives

1.) Identify the volatile sex pheromone of the Oriental cockroach and integrate it with other biopesticides (e.g., repellents, biological control agents, insect growth regulators) to effect reductions in pest populations.

2.) Demonstrate each component of the reduced-risk pest suppression program on a commercial farm, develop reference and training materials (manuals, interactive computer, videos) on reduced-risk pest control techniques and make these available to target audiences, including commercial producers (confined livestock and poultry) and county extension personnel.

Approach

A three-pronged approach will be used to document and demonstrate reduced-risk pest control approaches in confined animal production systems.

1.) Laboratory and field research will result in the synthesis of pheromones that are needed for the development of better pest management practices.

2.) Laboratory and field studies will evaluate the utility of these compounds for integrated cockroach management in swine production.

3.) In cooperation with a swine research facility and a commercial producer, participants will demonstrate the efficacy of this program and quantify reduction in human health and environmental risks.

Results

The findings during the first year of this project demonstrated that adult males of the Oriental cockroach, *Blatta orientalis*, responded to periplanone-B, a sex pheromone previously identified for the American cockroach, *periplaneta americana*. The female Oriental cockroach emits a unique pheromone which we have not been able to identify. Work is progressing toward isolation and identification of this pheromone. Nevertheless, the results indicated that a slow-release formulation of periplanone-B, produced and formulated by Hercon Environmental (Emigsville, Pennsylvania) could be used to monitor populations of the Oriental cockroach. Both laboratory and small-scale field studies confirmed the effectiveness of this formulation in detecting and monitoring cockroach populations.

Unfortunately, studies on the integration of pheromone with biological control agents and with reduced-risk bait formulations were extensively disrupted by two consecutive hurricanes in 1996. Field plots were badly damaged and data collection was discontinued. Additional data on this will be collected in 1997, and we anticipate completing this phase of the work after the summer of 1997.

Project duration
2 years

Budget:

SARE	
ACE	$38,840
Matching	$15,889

The demonstration phase of this project, as well as development of educational materials for growers, will have to await completion of the earlier phases of this project. We anticipate no pitfalls in the implementation of the educational component.

The results will provide the confined animal industry with a tool for monitoring pest cockroaches. Also, the utility of biological controls and baits will be documented in comparison with conventional strategies that are currently used to implement pest reduction.

The above report was submitted in 1996. No report was submitted for this project in 1997.

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Southern Region

AS95-24
Final Report
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Identifying Pesticides Most Compatible with Parasites of the Citrus Leafminer

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Objectives

The objectives of the research were to develop information on the toxicity of pesticides to a parasite introduced against the citrus leafminer (CLM) in a classical biological control program and to transmit that information to homeowners and citrus nursery and grove managers.

The citrus leafminer (CLM), *Phyllocnistis citrella*, has caused extensive damage in door yard trees, nurseries, and groves since its introduction into the USA in 1993. The natural enemy *Ageniaspis citricola* was collected in Australia, cleared through quarantine, reared, and released into citrus groves throughout Florida. *A. citricola* has established, overwintered, and dispersed from release sites throughout the 860,000 acres of citrus in Florida. The use of toxic pesticides to control other insects, mites, and plant diseases could prevent this natural enemy of the citrus leafminer from providing adequate control.

Approach

Laboratory bioassays were conducted to obtain data on the toxicity of pesticides commonly used in citrus pest management to *A. citricola*. Two types of bioassays were conducted, one comparing toxicity to adults of both the CLM and natural enemy using a clip- cage which consists of a "sandwich" of citrus leaves treated with water, 0.25-, 0.5-, 1- or 2-fold the field rate of each pesticide. Mortality is assessed after 24 hours.

Oil (used for control of insects, mites, and plant diseases), Align and Neemix (azadirachtin, a natural product from neem trees used as an insecticide), Micromite (diflubenzuron, a growth regulator used as an insecticide), Eclipse (fenoxycarb, a chitin-synthesis inhibitor used as an insecticide), Provado (imidacloprid, a systemic insecticide), Agri-Mek (avermectin, a natural fermentation product from a microorganism used as an insecticide and miticide), Neemgard (neem oil, a mixture of natural products from neem trees used as an insecticide), and Kocide (copper hydroxide, a fungicide regularly used to control fungal diseases in citrus) were tested.

Align, Neemix, Eclipse, Micromite, and Neemgard are relatively nontoxic to adults of both the leafminer and the parasite at all rates tested using clip-cages. Agri-Mek appears to be more toxic to adults of the natural enemy than to adults of the citrus leafminer in the clip-cage tests. When oil was tested, it was toxic to adults of both species, which was surprising because it has a reputation as a product that is useful in IPM programs. When oil residues were allowed to age for 24 or 48 hours before placing adults into the cages, the toxicity to the natural enemy was eliminated, indicating this product is useful in IPM programs because it has a very short residual activity.

Most of the products also were tested using a second method designed to assess the impact of these products on immatures of both the citrus leafminer and the natural enemy. After both tests were completed, two different ratings were compiled, one for that combined the toxicity of each product at the 1-X rate to both adults and immatures of the parasitoid *A. citricola* (Selectivity Index) and one that rated the product as to whether it was an effective insecticide at the 1-X rate against the target pest, the citrus leafminer (CLM efficacy index). The two were combined into an IPM compatibility index and the products were rated "Compatible, Semi-compatible, and Incompatible." Agri-Mek was an exception; because this product is so toxic to both the CLM and *A. citricola*, the Selectivity Index and CLM Efficacy Index (and thus the IPM Compatibility Index) were calculated using the 0.25-X rate.

Results

Neemix + oil, Micromite + oil, Eclipse + oil, and oil after 24 h and 48 h, were compatible with an IPM program because they suppressed CLM populations yet did not kill all the parasites.

Align + oil, Neemgard, and Admire were "Semi-compatible" because they were relatively nontoxic to *A. citricola*, but they were not highly effective against the CLM. The fish oil was selective and thus compatible as a foliar fertilizer; it did not show insecticidal activity against the CLM under these test conditions. Copper hydroxide, a fungicide, was moderately selective and thus is compatible with an IPM program.

Agri-Mek, even at the 0.25-rate, was so toxic to the CLM that no *A. citricola* could survive under these test conditions. Because it is such an effective insecticide, Agri-Mek was rated incom-

Project duration
2 years

Budget:

SARE	
ACE	$33,125
Matching	$24,487

patible with an IPM program at the 1-X and 0.25-X rate.

Provado and Ethion were only tested with the clip-cage bioassay because they killed all *A. citricola* adults at all rates tested. These products were considered "Incompatible" for an IPM program for that reason.

Potential contribution

The information obtained will be delivered to homeowners, nursery and grove managers, cooperative extension personnel, and growers via demonstration plots, publications in newsletters, trade journals, and peer-reviewed journals.

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Southern Region

AS96-25
LS96-81
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Controlling Cheat and Annual Ryegrass in Small Grains Using Novel Crop Harvesting Technologies

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Since McCormick first invented his reaper about 150 years ago, the age old drudgery of grain harvesting has slowly yielded to mechanization. After decades of gradual improvements, the grain binders and stationery threshing machines were finally joined together into machines known as "combined reaper-threshers". That term was soon shortened to the single word "combine", with the accent on the first syllable.

Modern grain combines are designed to rapidly and efficiently harvest and collect grain and return the straw, chaff, weed materials and weed seeds back onto the field. Over the past 75 years, grain combines have improved in numerous ways, but the primary function has remained the same. That is, collect the grain crop and return everything else to the field. An advantage of the old grain binder plus stationery thresher system of harvesting was that by carrying the bound shocks of grain and straw to the thresher, most weeds and their seeds were also carried off to one spot in the field. Our project is designed to regain this advantage by advancing the concept of grain harvesting a step further, to include separate collection of the seeds of weedy grasses that now pass through a combine and are returned to the field.

The seeds of Italian ryegrass and cheat are our primary targets because most of the seed of these noxious weeds passes through grain combines as they harvest wheat. Cheat is traditionally controlled by stubble burning and burying the seed by moldboard plowing. Widespread problems with cheat have prevented Southern Great Plains wheat growers from adopting conservation tillage.

Objectives

1.) Investigate three distinct modifications to conventional grain harvesting procedures designed to either remove cheat and annual ryegrass seed from the field during the wheat harvesting process or devitalize it.

2.) Evaluate the new harvesting procedures as a component of an integrated cultural grassy weed control system in on-farm situations.

3.) Determine the economic feasibility of the cultural weed control systems.

4.) Disseminate our findings to farmers, agribusiness, and other states.

Approach

Three approaches to removing and disposing of cheat and annual ryegrass are being investigated: a) Combine Mounted Recleaner Approach: The grain combine is adjusted to collect both the grain and weed seed, in the clean grain pan before being elevated to the grain bin, then the mixture is separated with a second cleaner (recleaner) mounted on the combine. The weed seed is either collected for feed or mechanically damaged to devitalize it and then returned to the field. The two options for disposing of weed seed were included because several wheat growers have told us that they would prefer not to collect the seed if we could just kill it and return it to the field. b) Chaff Collector Approach: Collect weed seed and shriveled wheat along with the chaff that is discharged from the combine over the cleaning sieves. Collected material is then removed from the field. Its value as livestock feed will be determined; c) Seed Cleaner Approach: The combine is adjusted to collect both the grain and weed seed in the clean grain tank. The mixture is then cleaned at the edge of the field. The weed seed and shriveled wheat is saved for livestock feed. All approaches are being compared to conventional combine harvesting for impact on weed densities, grain yields, economics and constraints.

For the 1997 harvest season, we modified the portable grain cleaner tested in 1996, added a secondary cleaner to our combine to reclean grain as it is harvested, and continued development of the mechanical weed seed devitalizer. The portable aspirator cleaning unit was modified by adding a hydraulic power system and a cyclone separator. The unit was successfully used at all on-farm locations to reclean the cooperators wheat for delivery to the elevator. Samples were collected for all experimental treatments. These samples have been officially graded. Data indicate that setting the combine to collect all weed seed and recleaning the grain at the edge of the field reduced dockage at the elevator and increased the USDA grade as much as one full grade. A second cleaner for mounting in the combine grain tank was designed and tested as part of the 1997 research. This cleaner is an aspirator similar in design to the commercially available portable unit but smaller and lighter to permit

Project duration

2 years

Budget:

SARE	$83,624
ACE	$208,624
Matching	$248,935

mounting it directly on the combine. Weed Seed removed by this cleaner was collected in a section of the partitioned combine grain tank. Performance was very satisfactory, but the cleaner will need to be modified to assure more uniform grain distribution as it is fed directly from the combine clean grain elevator. Experiments were continued to evaluate small roller and hammer mills to devitalize weed seed so that it can be returned to the field. This seasons results confirmed that weed seed could be devitalized without grinding the seed. The hammer mill appeared to be the mechanism of choice, because it could handle chaff and straw easier than the roller mill.

Field experiments established in June of 1996 were harvested by the aspirator-equipped Gleaner combine, and the experiments continued for a second year. Prior to harvest by the Gleaner combine, a plot combine was used to sample each plot to measure weed control after the first season. Treatments applied were: combined at normal setting with no seed collection, combine with normal settings and chaff collected, an and combine cleaning air speed set for grass seed, and all weed seed collected in the clean grain tank. All grain was cleaned with the portable cleaner at the edge of the field. Selected treatments were also cleaned with the aspirator recleaner as the grain exited the clean grain elevator in the combine. Data from these experiments have not yet been completely analyzed.

Economic Analysis

1.Grain samples from each system were collected at each location during the June 1997 harvest on cooperators' farms. These samples were submitted to the Enid Grain Inspection of Enid, Oklahoma. An official USDA grade was determined for each sample. These official grades will be used to determine the economic consequences of the alternatives.

2.A dockage schedule used by the industry during the 1997 harvest was employed to determine the dollar value for each sample. This information was also used to make economic comparisons of systems.

3.Samples of cheat, cleanings, and wheat grain from the various treatments were submitted for analysis by Servi-Tech Laboratories in Dodge City, Kansas. A comprehensive feed analysis of each sample (dry matter, crude protein, acid detergent fiber, TDN, NE_m, NE_g, NE_l, Swine DE, and Swine ME) was conducted. Results indicate that cheat seed collected during harvesting could be used as a high quality feed. It has much more protein than corn or oats and total digestible nutrients of over 80%. The nutrition information will also be used to make economic comparisons of alternatives.

4.Initial examination of the grain grading results has been performed, i.e. averages, yield estimation, discount values, and preliminary revenues. However, finalization of the gross revenues has yet to be resolved. The feed analysis has been completed and average nutritive values have been found, but valuation of the cleanings has not been completed.

5.Work is ongoing to confirm a market value for the cleanings based on feed value, establishing a gross revenue for the different harvesting methods, determining the costs that differentiate the techniques (thereby achieving a net revenue), and conducting model budgeting scenarios for possible usage of the innovative approaches.

Impact of results

Although data analysis is not yet complete, it is clear that our cleaners can reduce dockage levels to less than 2%. The combine can be set to collect nearly all the weed seed passing through the machine during harvest. The volume of this weed seed is great. Feed value, measured by a laboratory specializing in this type of analysis revealed that collected weed seed has substantial feed value. Observations made this year indicate that at three sites, where experiments were established in 1996, weed seed infestations were reduced by the combine set to collect weed seed. However, quantitative data have not yet been completely analyzed.

Potential contribution

The final year's research is expected to support observations on the effectiveness of the machines for collecting weed seed made this season. Next years data should confirm the agronomic benefits. We expect to show that at least one of the systems tested can be used by wheat farmers to improve weed control and to increase profits. Furthermore, the techniques and equipment being developed should be adaptable to other combine harvested grain crops such as rice, soybeans, grain sorghum, etc.

Professional Development Project Summaries

State Professional Development Program Reports

Each of the following states received an allocation of $10,000 to support training activities. Sustainable agriculture state coordinators from the 1890 and 1862 Land Grants submitted a collaborative training proposal, which was approved by the PDP Leadership Committee. These funds complement ongoing efforts in each state to provide sustainable agriculture professional development opportunities. The information presented below is not all inclusive; for more information on specific projects, contact the project director or PDP coordinator, Roger Crickenberger (919) 515-3252.

97-0496-09 Grant Proposal for Funding of a Southeastern Sustainable Animal Waste Management Workshop

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Funding for this grant was used to conduct a three-day workshop on sustainable animal waste management that included over 200 participants from diverse backgrounds. The purpose of the workshop was to explain why the audience needs to be concerned with managing animal waste; demonstrate current results and state of the art practices; show producers and professionals how to incorporate sustainability into conventional practices and let attendees realize that they can address environmental concerns in a profitable manner.

This grant also enabled the University of Georgia and other organizations to establish the interagency AWARE team, which is modeled after other commodity groups in the state. AWARE delivers quarterly newsletters, has established a web page, and coordinates many animal waste educational events.

97-0496-10 Louisiana Sustainable Agriculture Training Plan of Work

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Louisiana's sustainable agriculture program has dedicated the total resources of the LSU Agricultural Center and many other organizations to improving the quality of production through best management practices to meet the needs of the future.

Fourteen training programs brought together agents, farmers, homeowners, professionals, consultants and other agriculture organizations to see first hand all the various programs that were in progress to assist the agricultural community.

Master gardener programs, composting, calibration of aircraft and use of GPS systems training was also held to provide supplemental information to the public on these specific interest areas.

Approximately 2,600 cotton consultants, insect scouts, and chemical company representatives were educated on the latest insect scouting procedures and treatment thresholds at 29 grower meetings and 4 insect schools.

Future training areas will include reducing both source and non-point source pollution; utilization of compost to improve soil structure and productivity; utilization of GPS to monitor, sample and reduce inputs and costs; and system's approaches to problems in respect to the long-term management of agriculture.

97-0496-11 Virgin Islands Sustainable Agriculture Training Plan of Work

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A total of 21 members of the Cooperative Extension Service, Agricultural Experiment Station, U.S. Department of Agriculture and the V.I. Department of Agriculture staff participated in a series of development training sessions on the latest sustainable agriculture research and extension projects. Administrators from CES, AES, USDA and V.I. Dept. of Agriculture developed awareness of ongoing research and extension projects, as well as sustainable agriculture concepts and practices. By involving representatives of the various agricultural support agencies in the planning, concepts of sustainable agriculture were reinforced and dialog increased among the participants of the different agencies.

97-0496-12 Puerto Rico Sustainable Agriculture Training Plan of Work

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The scope of the Puerto Rico Training Program for 1996-97 consisted of two components in which extension agents and producers were exposed to alternative sustainable practices for coffee and starchy crops production. Ten agricultural agents in the coffee production zone were trained in theory and practices of crop production in collaboration with agriculture professionals from the College of Agricultural Sciences, State Department of Agriculture, Natural Resources Conservation Service and agribusiness. Later, extension agents identified leading producers in their area to attend a four-day training session to share experiences, problems and

identify possible solutions.

Fifteen extension agents and 45 farmers met to discuss topics related to sustainable starchy crop production.

An achievement day provided the opportunity for scientists and other agriculture professionals to visit the facilities and gain knowledge about areas in tissue culture and food technology. Lastly, participants became aware of services available to them through the Cooperative Extension Service.

97-0496-13 Florida Sustainable Agriculture Training Plan of Work

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Our training objectives are to: (1) enhance county faculty communication and interaction; (2) increase the ability of county faculty to provide information to farmers about ecologically sound and economically viable alternative farm enterprises; and (3) enhance the ability of small farmers to share information and participate in extension activities.

We addressed the three training objectives through coordinating of three projects:

Workshop on Precision Farming
Workshop on Marketing Strategies
Farmer Participation in Business Development Course

Through the workshops we enhanced county faculty communication and interaction and increased county faculty and small farmers' ability to provide and share information. We enhanced the ability of small farmers to share information through sponsoring farmer participation in Florida Fast Track business development course.

97-0496-14 Tennessee Sustainable Agriculture Training Plan of Work

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The sustainable agriculture planning process identified systems approach to decision making and implementation of marketing strategies as a high priority subject area. The purpose of the workshops was to train extension agents to work directly with farmers and others in the implementation of improved management and marketing decisions.

One hundred and forty Tennessee extension professionals received training during a two-day workshop that integrated production, management, and marketing in a total plan.

Information management systems were incorporated as a critical component of total resource evaluation on case study farms.

A training manual was provided to each agent that included teaching visuals and guideline steps for program implementation.

97-0496-15 Texas Sustainable Agriculture Training Plan of Work

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The goals and objectives of the Texas training plan are to enhance and maintain the fertility, productivity and conservation of farmland; maximize the efficient and effective use of agricultural inputs; protect or enhance the quality of water resources; and optimize the use of on-farm and nonrenewable resources. In an effort to achieve these goals, the following training was conducted:

Forty county agents attended an agent training in organic gardening/farming which included information on organic soil management, organic certification, entomology and plant pathology.

Five extension and 3 NRCS professionals and 59 producers received training in pasture management. Twenty-four extension professionals received training in cool and warm season vegetable growing, including the use of drip irrigation and forage management.

Three extension and one NRCS professionals received training in animal parasite control, including using proper cultural practices to control parasites.

97-0496-16 Oklahoma Sustainable Agriculture Training Plan of Work

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A steering committee comprised of members from NRCS, conservation districts, extension, producer associations and producers met to develop a prioritized set of target goals which included the following:

Improve producer involvement in sustainable agriculture training in Oklahoma consistent with the State Strategic Plan;

Improve curriculum development related to erosion control in Oklahoma;

Effectively train 120 professionals in erosion control and develop new integrated curriculum that could be used effectively in other training events with emphasis on distance learning methods.

Farmer/rancher participation was good and most felt that this was a beneficial exercise. Trainee adoption and direct impacts will be documented in the final report.

97-0496-17 Training Virginia Extension Faculty & Agricultural Professionals in Farming Practices Acceptable Under the Virginia Agricultural Stewardship Act

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In April, 1997, Virginia implemented the Agricultural Stewardship Act through the Virginia Department of Agriculture and Consumer Services. The Act's purpose is to develop and implement a "stewardship plan" that will eliminate or prevent water pollution problems caused by farming operations.

Approximately 110 ANR extension agents attended one of six district training programs that focused on sustainable agriculture, the Northwest Foundation, the University of Tennessee's Agri-21 program and the Agriculture Stewardship Act.

Meetings were held in the four dairy areas of Virginia with participation from dairy farmers, Soil & Water Conservation Districts, Natural Resources Conservation Service, VCE agents and the Department of Conservation & Recreation to discuss the Agriculture Stewardship Act as it relates to agency and producer issues.

(Internal NCSU subcontract) North Carolina Sustainable Agriculture Training Plan of Work

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The most notable activity during 1997 was the Sustainable Agriculture Task Force reorganization based on critical input from field and campus faculty. After a presentation of priorities from both NGO and Land grant perspectives, the joint group identified the following five areas for expansion and further discussion: mission/vision, public policy, systems approach, curriculum development, and on-farm research protocol. The following training activities were held: Two organic vegetable schools trained 40 agents; two rotational grazing schools trained 40 producers and 6 agents. Six agents received training at the annual Carolina Farm Stewardship Association Sustainable Agriculture Conference. A two-faculty retreat and Landgrant/NGO Summit for 45 faculty and NGO representatives. Provided travel for farmers who participated in the state strategic planning efforts.

New State PDP Implementation Plans

98-0409-09 Sustainable Agriuclture Action Plan for Puerto Rico, Puerto Rico Extension Service, Luis Mejia-Maymi

98-0409-10 Tennessee Sustainable Agriculture Training Plan of Work, University of Tennessee, Ray Humberd

98-0409-11 Louisiana Sustainable Agriculture Training Plan of Work, LSU Ag. Center/Louisiana CES, Dale Pollet

98-0409-12 Georgia SustainableAgriculture Training Plan of Work, UGA, Mark Risse

98-0409-13 Florida Sustainable Agriculture Training Plan of Work, University of Florida, Mickie Swisher

98-0409-14 Texas Sustainable Agriculture Training Plan of Work, Texas Ag. Extension Service, Nancy Roe

98-0409-15 Joint SustainableAgriculture Training Plan of Work, Mississippi CES, Alcorn State Extension Program Mississippi State University CES, Malcolm Broome

98-0409-16 Kentucky Sustainable Agriculture Training Plan of Work, Kentucky State University, Curtis Absher

98-0409-17 Oklahoma Proposal for Sustainable Agriculture Training for FY97-98, Langston University,Nelson Escobar

98-0409-18 South Carolina Sustainable Agriculture Training Plan of Work, Clemson University, Steve Meadows

98-0409-19 Virginia Sustainable Agriculture Training Plan of Work, Virginia CES/Virginia Tech, Mitchell Patterson

98-0409-20 Virgin Islands Sustainable Agriculture Training Plan of Work, UVI CES, Clinton George

Sustainable Agriculture Training Plan of Work, NCSU, Crop Science, Paul Mueller

Georgia Sustainable Agriculture Training Plan of Work, University of Georgia, Mark Risse

(FY95) State Training Plan of Work Mississippi CES, Mississippi State University, Malcolm Broome

(96) Joint Sustainable Agriculture Training Plan of Work Mississippi CES Alcorn State Extension Program MS State University CES, Malcolm Broome

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Sustainable Small-Scale Agricultural Development Training Project

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Objectives

Professional agricultural educators, community developers and organizational leaders with responsibilities for working with and directing small-scale farmers to:

1.) Become aware of and understand the appropriate use of the various small-scale sustainable agricultural models that are based on holistic approaches (production, management, and marketing).

2.) Acquire the necessary skills to work with grassroots groups, by using sustainable, holistic planning and management models that include, leadership development, strategic planning and evaluation, and communication and group decision making.

Approach

The training program, sponsored by the Southern University Cooperative Extension Program, College of Agriculture, and Heifer Project International (HPI), held two training workshops, phase one and two. The phase-two workshop was designed to both build upon the knowledge gained from the first, and to stand alone. Participants were encouraged to attend both workshops.

The first workshop (2 ½ days) was held at the HPI's Livestock Center in Perryville, Arkansas. The workshop focused on leadership development, understanding and applying sustainable development and strategic planning concepts and practices to small-scale and alternative agriculture. Forty-eight participants from 11 states in the Southern Region were in attendance. Participants' classification included county agents, community developers (NGOs), USDA personnel, farmers, and university researchers/extension specialists. Participants were divided into groups where each group, using a sustainable whole farm planning model, developed a farm plan, around sustainable concepts and practices. Actual participants' farms were used in these exercises. Each participant developed an individual work plan to be used when back with his or her small farm clienteles. The work plan included objectives, expected outcomes and time lines. Approximately 60 farmers, ranchers, processors and agricultural business persons attended a one-day training meeting held in conjunction with the workshop.

The second workshop (2 ½ days), held at Southern University, Baton Rouge focused on marketing, laws and regulations affecting alternative enterprises, and successful small farm sustainable production and marketing practices. The workshop ended with tours of the University's farm and three diversified small farmers' operations. More than 80 individuals from 12 states in the Southern Region to include the U.S. Virgin Islands attended the workshop. Approximately 75 percent of the participants attended both workshops. Evaluation results of the workshops showed that participants gained valuable knowledge on sustainable agriculture. Items receiving the most positive responses were the hands-on learning approaches, sharing of success stories and farm tours. The item receiving the least positive responses dealt with the sustainable conceptual framework. The results also showed that the participants, especially, county agents' attitudes toward sustainable agriculture were improving.

Project situation

The loss of small family farms has increased significantly in the USA and nowhere has that loss been felt more strongly than in the Southern Region. To reverse this trend, we must find ways to increase small farm profitability through sustainable agricultural approaches that are holistic, regenerative, innovative, environmentally sound, readily taught and practical to set up on small land-holdings. The beginning educational link was to have a qualified cadre of professional agricultural workers who understand agricultural models, practices and concepts that are relevant to successful small-scale farming. These workers needed to appreciate the system's developmental approach to include external factors such as viable small farm communities, local markets, and employment opportunities that contribute to sustainable small-scale farming. The 1890 Extension System and various NGOs in the south, had a cadre of such persons. These individuals tended to be educated and have experiences in conventional agriculture to include using component research, education and development approaches. To accomplish the desired results will require these

Project duration
1 year

Budget:
SARE $25,701
ACE
Matching $25,701

workers to begin to use a system approach, thus creating the need and opportunity for this training program.

Outcomes and accomplishments

Major outcomes of the two workshops include approximately 100 trained professional agricultural workers in the South with major responsibilities for small farm agriculture. These workers, based on preliminary survey findings, feel if though they are making progress with reaching and teaching small-farm operators sustainable agriculture. The working relationships among small farm educators, advocate groups and technical assistance providers have increased. Southern University, the host institution, reports expanded research and educational programs. The small farm clientele base is expanding to include more organic farmers and the number of small farmers selling at farmers markets is increasing.

Dissemination of outcomes

The following information is being compiled for dissemination to participants and others with responsibilities for small farm agriculture. The presentations of all the speakers are currently being compiled into a proceeding/primer for distribution to the Southern small farm audiences. Additionally, during the workshop, participants divided into groups and developed a report based on the following three questions:

What are the major components of Sustainable Agriculture System (Start the discussion with the 1990 Farm Bill Definition and include some discussion on the implications for daily living)?

What are the greatest challenges to increasing understanding and/or use of sustainable agricultural practices?

As an educator, what can or will you do to overcome these challenges?

Results of these discussions are being compiled for dissemination to participants and others.

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Southern Gathering on Agricultural Problem Solving

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Objectives

Involve extension professionals, other farm service institutions, public media, and farm families in the collaborative development and delivery of curricula on issues deliberation, strategic planning, and conflict management.

Foster collaboration between educational institutions, extension professionals, and extension clientele in delivering materials and concepts to workshop participants.

Cooperate with the Kentucky Leadership for Agricultural and Environmental Sustainability Project, the University of Kentucky Agriculture 2000 Project, and the National Issues Forum initiative of the Kettering Foundation to achieve synergism between development programs.

Cooperate with partners in publicity of project activities.

Solicit balanced participation by diverse farm community sectors, with attention to gender, race, farm related income, disability, and other relevant demographic characteristics.

Develop participant ability to apply methods of problem-solving to agricultural and broader-based community issues.

Include hands-on learning activities in curriculum development (ie: role playing, simulations, and creation of action plans to be implemented in home communities of participants).

Bring about change in farm community agendas, production and marketing practices, and farm community infrastructure through application of concepts by workshop participants.

Evaluate the workshop efforts focusing on changes in knowledge, opinions, skills, and aspirations. Include a wide range of people in the evaluation.

Approach

The goal of the Southern Gatherings on Agricultural Problem Solving is to build community capacity to recognize and manage change. Rural agricultural communities face many pressures: to increase farm profitability, reduce environmental impact of production, respond to changes in markets and farm policy, and to manage development. As individuals choose their own responses to these pressures, the outcome may be a weakening of the community as a whole. The Southern Gatherings on Agricultural Problem Solving help build community capacity (strengthen communities) by giving community members the skills they need to come together, talk about issues, resolve conflicts, make choices and design and implement strategic plans. The fundamental assumption of this project is that communities who can go through these processes together will make decisions and take actions that address the fundamental interests of all community members. It is assumed that there is a common ground and that communities don't need to be divided along lines of agriculture, environment, or economy. Participants can use these processes to find and define that common ground.

Progress of the project to date has included two "Southern Gatherings on Agricultural Problem-Solving". The first, October 9-11, 1996 was held at the Rural Development Center in Somerset, KY and included 125 participants and presenters, most from Kentucky,adjacent states and the southern region, but some from as far away as Arizona. The second, November 5-7, 1997, also at the Rural Development Center included 54 participants and presenters, most from Kentucky and adjacent states.

Each of the annual gatherings offers three learning tracks: 1) public issues deliberation; 2)conflict resolution; and 3) strategic planning. Farmers, extension agents, community leaders and others choose one of these three tracks. Plenary sessions draw common themes and lessons from each of these problem-solving approaches and suggest ways to apply them in the participants' home communities.

Significant outcomes of this project have been the development of in-state capacity to train participants and trainers in the three skill areas of public deliberation, conflict resolution and action planning, the application of those skills to local (county) projects and trainings, and a better understanding of how to make these skills accessible to grassroots community members.

Project duration
2 years

Budget:

SARE	$52,000
ACE Matching	$113,500

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Facilitating Farmer to Farmer Networks: An Experimental Approach

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Objectives

This joint University of Florida and Florida A&M University project will explore alternative approaches that Extension can use to facilitate the development of small farmer networks. Recently formed, local small farm networks will participate in a 18-month program of activities. Activities will include an initial workshop to share experiences with farmer networks from the Southern Region, training in basic concepts of sustainable agriculture and group processes, local network activities based on need and interest, and a participatory self-evaluation process in which representatives of local groups come together to share experiences, solve problems, and analyze activities. The principal faculty involved in the project will develop a handbook based on the network experiences for distribution in the South.

Approach

Farmer-to-farmer exchange is a critical aspect of building sustainable agricultural systems. This project has thus far worked with several local farmer groups in North and Central Florida where most of Florida's small farms are located. Agents have been responsible for locating farmers or existing farmer groups that exhibit such characteristics as emphasis on sustainable agriculture, small farm membership, willing to work with extension, significant potential for growth, and demonstrated commitment to facilitating successful group processes.

Proposals to participate in the program have been submitted, but room is available for more proposals to come in, which we expect. These eleven proposals submitted and approved have justifiable goals according to our program, processes for achievement of these goals, and also contain budget proposals. What we have found is that the majority of proposals have focused on increasing market share for small farms based on alternative approaches to marketing of farm products. These approaches include developing marketing associations, direct marketing and contract growing of specialty crops, increasing marketability of meat products through producer and consumer education, formation of the Southern Commercial Rabbit Producer's Association, value-added production, and establishment of retail farmers' markets.

Several of the projects have begun while the balance will be beginning in the spring of 1998. We attribute this to some lack of communication and understanding between investigators and county agents, and understandably so as the extension approach being used is new to both parties. Three workshops have been presented in three different counties in North Florida for the purposes of drawing attention from local farming communities to the project's existence, as well as responding to requests that farmers have posed to us in order to better facilitate understanding of alternative methods of marketing. In each workshop two speakers were presented that are considered very knowledgeable in their respective fields. Turn out for each of the workshops proved to exceed expectations, signaling to us the desire of local farmers to explore farmer-to-farmer networking as a means of strengthening marketing methods. In addition to these workshops, several others have occurred that were presented by farmer-participants currently working in the farmer-to-farmer project.

Project Situation

The primary objectives of this project are to facilitate small farmer networks that will exchange information, test and compare alternative farming systems, and develop strategies for marketing and adding value to farm products. Approaches to accomplishing facilitation of small farmer networks have included: identifying existing networks looking for further support or for identifying key players interested in beginning farmer networks, providing successful examples from other established networks in the Southern Region, assist in network development, provide formal training, and ultimately analyze and share experiences. Outcomes and accomplishments will be reported below against these approaches to achieving our stated objectives.

Identifying Players

Identification of local networks or farmers meeting criteria laid out in the abstract section has occurred. Participants for the program have been selected on a competitive basis.

Successful examples

We have arranged for three separate

Project duration
1 year

Budget:
SARE $80,997
ACE
Matching $80,997

workshops detailing sustainable agriculture as defined in the 1990 Farm Bill along with alternative approaches to marketing based on group participation. Support has also been given in bringing in speakers from other land grant universities in the south to speak on various farm management methods on both goat and rabbit production operations in North and Central Florida. Two farmers have traveled to Kansas and Colorado to beef cattle ranches and feedlot operations to gain a better understanding of what both are looking for from North Florida cow-calf ranchers. Since returning these gentlemen have traveled to present their findings to several beef and forage groups and cattlemen's associations.

Network Development: Network development has been in the form of technical backstopping. Ostrich association members have been assisted in developing consumer-oriented educational materials for county fairs. News coverage in local papers is one outcome of their increased visibility at county fairs. Materials have also been developed for the beef marketing project participants to aid in their workshops, as well as for the Suwannee Valley Research and Extension Center alternative crop and production field day.

Formal Training: Training for the 14 cooperating county extension agents has been a crucial factor to the success of this project. Agents have gathered on two separate occasions at the beginning of the project to cover the questions, "What is sustainable agriculture according to recent USDA Farm Bills," and "How and why will we achieve farmer-to-farmer networks." A teleconference was used in collectively discussing and deciding upon proposals to be funded. Materials covering topics on both the facilitation of agricultural sustainability and examples of successful farmer networks are sent to the 14 participating agents on approximately a monthly basis. The workshops that have been presented for the project have further served as agent training.

Dissemination of outcomes

At the end of the network activities, members from all groups will come together again in a wrap-up workshop to share experiences and lessons. This workshop will focus on self-analysis where each of the local projects will be analyzed by all participants. Bases on this workshop, the Principal Investigators will develop a handbook that summarizes and analyzes different approaches. The handbook will be shared with farmers and other agricultural professionals throughout the Southern Region.

Video taping of workshops given thus far for the project have been copied and distributed to the guest speakers and to all participating agents for their respective agency libraries.

Impacts and contributions

As per trainees ability to respond to information requests of producers, assist farmers in problem-solving, develop sustainable agricultural systems, and serve as resource persons we feel that these trainees are indeed increasing their potential for impact. We have been informed about trainees ability to assist farmers and other agricultural professionals on different occasions.

Trainee adoption and direct impact

Training has shown to positively affect participants knowledge, attitudes, and behavior. Because of the nature of this particular project it should be noted that adoption and impact has been realized with both farmer and extension agent participants.

In addition, we have had five participants attend the FAST-TRAC entrepreneurial training program as well as three extension faculty attend programs on FAST-TRAC training.

Feedback

The principal investigator has had conversations with farmer attendees at different workshops and has found this type of project to be successful. Ranchers at the beef and forage groups and cattlemen's association meetings have stated a much greater understanding, for example, of what is needed to achieve success in cattle management and marketing.

New hypotheses

We need to try again to get the entire leadership group together sometime around the beginning of the new year.

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Sustainable Agricultural Marketing Through Collaborative Policy Development

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This project has developed a research-based methodology for creating new marketing and policy systems related to sustainable agriculture. Marketing and public policy are inextricably intertwined in agriculture. Sustainable agricultural systems have been especially stymied due to lack of an effective process and skills to implement that process in development of new marketing and policy systems. Participants in this project have delinated the benchmarks which spin out of a successful process and the skills which successful facilitators of the process posess.

A series of workshops in Kentucky, Arkansas and Tennessee used the successful and sustainable value-added diversification programs of North Dakota, New Zealand, Minnesota and Australia as a means of developing what participants call the systems facilitation process and skills. These results were aided by a national multi-disciplinary team which was assembled to analyze the results of the workshops.

The benchmarks which spin out of the process as it succeeds are: open stance, systems thinking, common assumptions, defined problem space, integrators emerging and path synthesis.

The skills common to successful facilitators of the process are: learning systems, social motivation, nonverbal communication, team-building, evoking integration and innovation, conceptual pluralism and holistic feasibility analysis. Results of the project are presented in detail on the web site www.deltanetwork.org.

A summary of state policies related to sustainable agriculture has also been produced by the project and is being distributed free of charge by the Kentucky Department of Agriculture, Office of Environmental Advocacy, Frankfort, Kentucky.

Objectives

Participants will design cost effective agricultural value-added marketing options tailored to their state and a policy education/research process to refine and implement the options.

A hands-on manual based on these methods and tailored to local policy education/research on diversification/value-added marketing will be created and field-tested in multiple states including Kentucky, Tennessee and Arkansas.

Methods

Systems facilitation is a method to help groups explore systems constraints and opportunities and synthesize unique and motivating plans for policy activities. In all parts of the South extension, NRCS, and other change agents often feel pressed to be the expert in every field. The systems facilitation approach provides another professional role for agents. By acting as a facilitator, the agent can take a more neutral stance between differing perspectives and different sources of information. The construct group process sets up a co-learning environment where everyone recognizes they can learn something from everyone else. The farmer has much to offer, as do the researcher and the businessman and legislator. The facilitator in this approach does not just ease the flow of information between differing perspectives. Rather, as an integrating facilitator, the local agent uses the raw data of differing information and perspectives to create a consensus conceptualization of a particular problem space. In group meetings this is done by separating brainstorming from priority setting and between the two sessions recruiting group "leaders" (who emerge as adept at integrating in the brainstorming session) to help group and summarize the ideas, information and perspectives which emerged.

The facilitator helps the group to establish a systems perspective, a key part of which is looking for feedback loops--both inside the system and between the system and other systems outside it. A basic goal of the method is a qualitative one--achieving synthesis of perspectives or paradigms. Success can be inferred from the establishment of state, agroecoregion and local teams across ideological boundaries devoted to creation of Southern agricultural systems which are productive, supportive of rural communities, profitable for farmers and environmentally sound.

Results to date

A series of workshops have been held in four states which have successfully recruited prominent local businessmen, farmers, USDA staff, legislators and others to work on policy change in diversification/value-added marketing.

Project duration

1 year

Budget:

SARE	$40,900
ACE	
Matching	$34,000

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-15
New Project
December 1997

Kentucky Cooperative Extension System Training Project

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Objectives

1.) To educate 1862 and 1890 Extension professionals and paraprofessionals about sustainable agriculture. Behavior change: An increased awareness and acceptance of the practicality of sustainable agriculture.

The Kentucky State University Research Farm has been developed as a demonstration of sustainable agriculture. The Research farm will host monthly mini-field days and a statewide field day to show and educate the participants about the sustainable agriculture practices that are utilized on the farm. The funds will also cover partial costs of continuing training and education for Extension staff (and research staff who are involved in farmer education projects) in the area of sustainable agriculture -- travel to training meetings both instate and out-of-state.

2.) To educate 1862 and 1890 Extension professionals and paraprofessionals about practical uses of organic agriculture. Behavior change: An increased awareness of the practicality of organic agriculture for selected farming practices with a particular emphasis on limited-resource farms.

The Kentucky State University Research Farm has developed several projects that are certified organic. The research Farm will host monthly mini-field days and a statewide field day to show, tell and educate participants about the use of organic agriculture and reduced use of pesticides.

3.) To educate farmer leaders (members of the Kentucky Agricultural Advancement Council and Area Agricultural Advancement Councils), NRCS and agency employees and farmers about sustainable agriculture and organic agriculture and the need for leaders to share this information throughout their local communities.

Selected mini-field days and the statewide field day (described in #1 and #2) will include the above clientele. This project will also include three on-farm demonstration projects for use in field days. Funds will also cover the costs of a meeting of the Kentucky Agricultural Advancement Council which will focus on continuing needs for (progress of) sustainable agriculture as identified by the statewide focus groups during the development of the Sustainable Agriculture Plan for Kentucky which was developed in 1995 and discussed at the first statewide Agricultural Advancement Council meeting in 1996.

The Kentucky Cooperative Extension System Training Project has successfully developed multidisciplinary teams of farmers, 1890 and 1862 Extension and Research professionals and paraprofessionals, NRCS and other USDA agency professionals and technicians, Kentucky Department of Agriculture and other state agency staff, Heifer Project, Intl., agribussinessmen, and veterinarians to address sustainable agriculture issues in Kentucky. Nearly 65 people regularly attend the monthly mini-field day training sessions with over 400 attending the statewide field day. Many participants commute three to four hours to attend. Most voluntarily return. Enthusiasm is high as participants look forward to the next training sessions.

Many topics have been covered including marketing; organic, traditional, and sustainable production of grain, tobacco, vegetables, fruits and nuts, livestock and forages; water quality and environmentally friendly agricultural production; special needs of small, minority and limited-resource farmers; and the natural progression of the Kentucky State University Research Farm throughout the year.

Project situation

The need for farmers to employ sustainable agriculture in their farming operations is of growing concern, particularly in the South where the population is relatively dense and many lands are highly erodible. In Kentucky, many farms are located on Class 3 or higher soils which drain directly into the water supply and rivers and streams. Many soils are karst with underground caverns and sinkholes. These characteristics increase the need for environmentally sound agriculture. The Kentucky Water Quality Act legislates the need for environmentally sound agricultural practices to be implemented on all Kentucky farms of 10 acres or more within five years -- this strengthens the need for sustainable agriculture training across Kentucky as farmers and educators develop water quality plans for their farms. As many of Kentucky's farms are small and/or limited-resource, the need for low cost,

Project duration

1 year

Budget:

SARE	$50,000
ACE	
Matching	$79,250

sustainable practices becomes greater.

The project plan primarily centers around monthly mini-field days held at the Kentucky State University Research Farm and other training sessions held at the Research Farm. The repetitive nature of the mini-field days allows participants to observe the natural progression of the activities of the farm. The farm has been developed as a demonstration of sustainable agriculture with some parts certified organic. Farmers, 1890 and 1862 Extension and research, and numerous state and federal agencies have been involved in the training and have been recipients of the education. The project has stressed multi-disciplinary efforts and brought public and private entities together as both educators and trainees.

Accomplishments

The outcomes and accomplishments of objectives 1, 2 and 3 are closely related and will be summarized below. Most of the training involved all groups working and teaching together, discussing issues, and recommending upcoming topics. Farmers, veterinari ans, agribusinessmen, USDA and state agency personnel, 1890 and 1862 Extension and research professionals and paraprofessionals were intricately involved in the training.

The 1997 training sessions hosted by the Research Farm are summarized below:

February: Small Farm Issues training for 1890 and 1862 County Extension Agents and Small Farm paraprofessionals, Extension Agent continuing education

August/October: Water quality training for county level staff: NRCS and 1890 and 1862 Extension -- 14 state and federal agencies worked together to provide the training, county resource teams of Extension and NRCS employees were developed

February, March, April, May, June, July, October, November, December: Mini-field Days at the Kentucky State University Research Farm -- Each mini-field day included a tour of the farm, numerous topics on sustainable agriculture, organic agriculture topics, group discussions, and hands-on practices. Efforts are made to include 1890 and 1862 Extension and research staff, USDA and state agency personnel, farmers, and farm input suppliers as educators in each training session. Farmers attending range from FFA/4-H youth to elderly farmers, traditional to organic, very limited- resource to relatively large farmers, minority and women farmers, part-time to full-time farmers, and farmers with disabilities.

September: Statewide Stewardship Farming Field Day with an emphasis on small scale farming -- over 50 topics were offered to some 400 participants. The field day started as early as 5:30 am for workers and lasted well into the evening as farmers and agribusinessmen lead a campfire discussion about sustainable agriculture at the conclusion of the field day. The multi-agency, multi-disciplinary field day was highly visible as participants came from across Kentucky and into Tennessee and Ohio.

Additional parts of Objective 1 are summarized below:

October: Support of the Kentucky State University Research Farm Manager to attend an international small farm trade show in Italy

April, May, June, July: Support of Kentucky State University Small Farm paraprofessionals to attend seminars pertaining to research and Extension efforts of KSU Land Grant Programs. These training sessions will enable our Kentucky State University Extension staff to relay information back to their county Extension programs and to their small farm clientele.

Additional parts of Objective 3 are summarized below:

- August: The semi-annual meeting of the Kentucky Agricultural Advancement Council: This session brought the Extension agricultural leadership together to discuss issues that pertain to their regions of Kentucky, to present their concerns to the University of Kentucky College of Agriculture, and to obtain information to share with their respective regional agricultural advancement councils.

Dissemination

Dissemination of the information is primarily through participation in the field days/training seminars. Announcements are made via the Horticultural Department s e-mail newsletter and information publication. Agriculture classes from both public and private high schools have attended the field days, as have members of the Community Farm Alliance, the Organic Growers Association, various commodity groups, Heifer Project, Intl., and the Kentucky Farm Bureau. A presentation was made at the PDP State Coordinators meeting and will be made at the Southern SARE meeting in January. Extension agents and paraprofessionals have shared information with local farmers, NRCS employees and have conducted related demonstrations. A news article was published in the

Sustainable Agriculture Trainer/ Volume 3, No. 3. Other distribution mechanisms are being discussed.

Contributions

Although the project is not completed, the immediate benefit is the ad hoc development of multi-agency, multi-disciplinary teams who are committed to sustainable farming efforts throughout Kentucky. These teams are composed of farmers, farm input suppliers, veterinarians, paraprofessionals, researchers, specialists, administrators, the public and private sector, non-profits, and USDA and state agency personnel. Trainees have been exposed to many different topics and production and marketing practices.

Several topics are being considered for on-farm extension demonstrations.

Several participants are being surveyed -- the results will be sent as an Addendum as will letters and comments from trainees. Verbally, trainees indicate they have gained new knowledge and are changing their attitudes and understanding of sustainable agriculture. This is particularly true for organic production.

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-16
New Project
December 1997

Developing Trained Professionals and Teaching Aids to Support Educational Programs Addressing Management of Stored Grain

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Objectives

1) Conduct a train-the-trainer seminar whereby county extension agents and key farm leaders will receive current information on the management of stored grains. Training will emphasize an IPM approach that minimizes insect damage, mycotoxin levels and pesticide residues thereby maintaining the highest possible grain quality and profitability for the grower.

2) Conduct a demonstration of post-harvest management systems that will begin in the fall of 1997 and be available for observation and training purposes at the seminar to be held in the spring of 1998.

3) Improve the quality of educational materials available to county agents and farmers by a)producing an instructional video tape emphasizing management techniques discussed at the seminar, and b)publishing a proceedings of the seminar which will include results of the demonstration as well as other pertinent information which could be used for training purposes.

Approach

The primary objective of this project is to improve the knowledge base of county extension agents and farm leaders regarding management techniques for maintaining post-harvest quality of grains stored in southeastern states. Training will include consideration of the unique insect and mycotoxin problems associated with high temperature and high humidity conditions during storage and emphasize a systematic management approach.

The University of Georgia Cooperative Extension Service along with the Alabama Cooperative Extension Service will work together to conduct a train-the-trainer seminar at the Coastal Plain Experiment Station in Tifton, Georgia on March 25, 1998. The 1890 land grant universities, Fort Valley State and Alabama A&M will be invited to participate along with representatives of key organizations such as the Georgia Corn Commission, the Alabama Feed Grains Commission and the Georgia Corn Growers Association.

The project will address the increased insect and mycotoxin problems associated with grain stored in southeastern states. One of unique problems that will be addressed is field infestation of corn by the maize weevil, the key pest of stored corn in the south.

As of this report, the project is well under way and on schedule to be completed as planned. The training seminar has been scheduled, the storage demonstration has been initiated and the results will be available for viewing at the seminar. Production of the instructional video tape is well under way and the final product should be available in the spring of 1998.

We hope that by communicating the results of this project to people that serve as key sources of information, the project will eventually impact all grain producers and grain handlers in the southeast and improve the quality of our grain and the profitability of grain production. Increased grain production in the southeast will improve crop rotations and increase utilization of minimum tillage systems.

Project situation

Grain production in the Southeastern United States, while small compared to that in the midwestern states, is an important part of more diverse agricultural system. Many growers plant small grains as a winter cover crop not only for additional income but for control of soil erosion. Minimum tillage systems utilizing winter grain crops are becoming more and more common. Corn and grain sorghum production during the summer months is a vital link in the crop rotation schemes for many growers.

Unfortunately, grain production is marginally profitable in most years. Disease, insect, nematode and weed problems are more severe in the southeast making costs of production higher and yields lower than those in the Midwest. Producers that attempt to store their grain on the farm commonly find that warm, humid conditions create numerous problems that add an element of risk to economics of grain storage.

Despite the widespread and serious nature of grain storage problems in the southeast, there has been little educational effort to address the problem. Most educational programs target production problems rather

Project duration
1 year

Budget:

SARE	$38,150
ACE	
Matching	$38,150

than post harvest problems. The objectives of this project attempt to address the problem of post harvest losses in the southeastern states.

Outcomes and accomplishments

Objective 1- A train the trainer seminar has been scheduled for March 25, 1998 at the University of Georgia's Rural Development Center in Tifton, Georgia. The program has been made available to a maximum of 30 county agents in Georgia and Alabama through the normal in-service-training programs offered in each state. We are currently accepting applications for the training. Additional invitations will be made to representatives of selected commodity organizations.

Objective 2- The corn storage demonstration was initiated in early September and is on schedule for completion at the training seminar to be held in March. Corn was purchased and loaded into each of four storage bins located at the Coastal Plain Experiment Station in Tifton. Each bin is currently under a different management plan and data is being collected to document environmental conditions in the bins as well as insect pest populations, grain quality and grain value. All of this data will be presented at the training seminar and the bins will be open for viewing.

Objective 3- The instructional video tape is currently under production and on schedule to be completed by the completion of this project. It is being produced in segments which will be edited into a comprehensive description of proper grain storage procedures. Segments dealing with proper timing of harvest, loading and insect monitoring have been completed while the aeration segment remains to be done. Proceedings of the training seminar will be prepared in the following months and will serve as a source of reference for county agents and agricultural leaders that will be in a position to advise growers.

Dissemination of outcomes

This project has not yet reached the point of dissemination outcomes. Our plan is to do so through the training seminar scheduled for March 25, 1998, the video tape current under production, as well as through handouts and proceedings. There may also be opportunities for television and radio coverage of results.

Potential benefits

This project will provide a source of reliable information about an agricultural problem that up till now has gotten little attention. We hope that this information will be the impetus for farmers to make better decisions regarding on-farm storage of grains and to do a better job of managing their grain when they do decide to store it on their farms. We are convinced that better management will lead to increased quality of grains from the southeastern states, an improved reputation of southeastern grains in marketing channels and better food and feed products from those grains. Farmers should realize improved profits from grain production making them more likely to grow them thereby improving overall crop rotations and better utilize minimum tillage systems.

We also envision commercial grain handlers benefiting from this project. Although commercial handlers are well aware of the risks involved in long term grain storage, many are too reliant on chemical solutions to insect problems and do not have reliable grain management programs in place.

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-17
New Project
December 1997

Overcoming Training Obstacles: A Realistic Cost-Effective Approach

Project Coordinator

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Paramount to the survival of limited-resource/ small-scale farmers, is the reduction of their risk of vulnerability to continuing changes taking place in agriculture. Such changes have been technological, financial and demographic. The urgency for empowering farmers with the most important tools for survival cannot be over-emphasized. The most cost-effective means to accomplish the task is through collaborative training of farming agents and similar professionals; appropriate organizations; governmental agencies; and the farmers themselves. Overcoming obstacles to such training in a manner that is realistic and cost-effective provides the greatest enhancement to sustainability and attainment of goals as delineated in the South Carolina State Training Program.

Behavior-based objective

Focusing on long-term sustainability of farms and rural communities in South Carolina, as reflected in the South Carolina strategic Plan, and the Southern Region SARE Program, there is but a single objective of the State training Enhancement Project as submitted in this proposal: Sixty agents will be trained to overcome identified obstacles that would impede the effectiveness of training outlined in the Strategic Plan.

Predominant is the implementation of a cost-effective and realistic approach to the elimination of obstacles that would result in a definitive improvement of training.

In South Carolina identified obstacles would include, but not be limited to the insufficiency of delivery of information; technical support by professional extant to the institution; on-site demonstrations; cross-education between large- and small-scale farmers; marketing of training programs to potential participants; comparative data developed to reflect cost-benefit analysis of conventional versus alternative farming.

Project duration

1 year

Budget:

SARE	$10,000
ACE	
Matching	$10,000

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-18
New Project
December 1997

The First Requirement of Agriculture Sustainability: Efficient Management of Available Resources

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Limited-resource/small-scale farms, the type most frequently operated by African and native Americans are vulnerable to the overall changes that have taken place in agriculture. There has been and continues to be a significant and disproportionate decrease of Black and American Indian farmers and land lost by these groups. They lack knowledge of management strategies that are influences by tax law, terms of credit, agricultural farm policy, types of farm business ownership, inheritance transfer mechanism an and legal instruments fro maintaining or acquiring land.

The first requirement of sustainability relative to limited resource farmers is to become effective managers of limited resources, both renewable and no-renewable. A review of decision case studies of selected small farm situations will introduce the agriculture agent/advocate to real life management situations. By using decision case studies to train agents, the overall objective would be to prepare agricultural agents to function in real world situations (not contrived or simulated) that force them to make decisions utilizing sustainable agriculture productive and management principals therefore, making them better professionals and more effective change agents for limited resource farmers.

Previous training by the South Carolina Cooperative Extension Service focused its efforts on the training of agents in the precepts of sustainable agricultural production and integrated pest management practices that would eventually result in the reduction of off farm inputs by practicing farmers. This proposal will meet the needs of limited resource farmers by training the trainers to become more effective agents in the transfer of knowledge of management strategies and effective utilization of agricultural policy to created a more sustainable agriculture.

Sixty agricultural agents participating in a South Carolina train-the-trainer mini-course/ workshop will acquire knowledge and develop skills to:

1.) Help farmers define specific objectives and develop short and long term strategies for a profitable and sustainable agriculture.

2.) Identify practical and accessible information resources and recommendations for sustainable agriculture practices.

3.) Design and test appropriate integrated management strategies that will efficiently utilize available resources, reduce off farm inputs and generate a profit.

4.) Increase capacity to analyze and critique integrated systems research, improve their decision making and teaching skills involving complex relationships within/ among biological, financial and/or social systems.

5.) Identify management problems and recommend integrated management strategies of whole farm systems that will generate a profit and perpetuate ownership of family farms.

6.) Build greater institutional support for sustainable agriculture training both within and outside the land grant institution.

Project duration
2 years

Budget:
SARE $60,000
ACE
Matching $60,000

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-19
New Project
December 1997

Nuisances in the Community: Training on the Issues and the Methods of Mediation

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Cooperators continued on next page

Objectives

The objectives of the "Nuisances in the Community" video project include examination and analysis of the following areas:

1.) Nuisance laws in the Southern Region

2.) Right-to-Farm laws in the Southern Region

3.) Anti-corporate farming laws in the South ern Region states

4.) Odor regulations in the Southern Region

5.) Environmental regulations controlling live stock operations in the Southern Region

6.) Examples of community confrontations oc curring in the Southern Region around the ex pansion in size of agricultural operations, particularly livestock operations

7.) Principles of alternative dispute resolution, generally, and mediation laws in place in the Southern Region specifically;

8.) Examples of successful mediation techniques and discussion of how mediation principles can be effective in resolving community disputes

9.) How the principles of sustainable agriculture can be used to address community concerns associated with nuisance problems and agricultural operations

The project is intended to provide the agricultural professional and sustainable agriculture professional and those involved in agriculture production with information, and hopefully some level of understanding, of the myriad of complex legal issues impacting the movement toward intensive agricultural operations. These legal areas include nuisance law, right-to-farm legislation, anti-corporate farming laws, and environmental and odor regulations. Each of these legal areas is under intense scrutiny in some of our state capitals with the advent of "factory" agricultural concerns.

The project will also provide these same agricultural professionals with an exposure to the tool of mediation as a means of resolving community disputes relating to agricultural operations. This is a relatively new arena for mediation, as it involves the resolution of conflict with regard to community-wide concerns, and with regard to the appropriate use of natural resources. The traditional use of mediation within the agricultural community has been with financial issues, with only a few exceptions. The project will examine groundbreaking work in this area and explore the potential use of alternative dispute resolution in resolving community-wide agricultural related conflicts.

Project situation

Since the time the grant was awarded, the principal investigator has been involved in a variety of tasks associated with the video production and preparation of associated written materials. The project is to include an analysis of the nuisance, right-to-farm, anti-corporate farming, and environmental and odor regulations and statutes from each of the 13 southern states. This information was to be presented, accordingly to original plans, via 13 separate video productions. After consulting with video production professionals associated with the project, we determined this method would be cost prohibitive, therefore, the project findings will be presented via one video, containing standard language and explanations applicable to each of the thirteen states, accompanied with written materials particular to each of the states. This method of presentation will allow us to accomplish the end result within the budget constraints.

While the project is not yet complete, we can offer the following findings or outcomes. Video footage has been shot in several states at this point. We have been able to capture many farmers and ranchers, rural citizens, legislative/policy leaders and academics on tape offering their comments regarding the state of these laws. We have made production decisions based on the volatility of the issues within particular states in order to show the potential for intense conflict around these issues of corporate or factory farming and communities. Some community groups in the region have been extremely active in educating themselves with regard to the applicable laws and regulations and participating in the changes to those laws and regulations. This sometimes occurs while corporate farming entities, regardless of the sometimes heated debate, continue to increase presence within the state.

We continue to shoot additional footage for the video and anticipate capturing many developing issues within the next few months. We then will enter the final stages

Project duration

1 year

Budget:

SARE	$ 56,000
ACE	
Matching	$ 14,000

of editing and preparing both video product and accompanying written product for distribution in spring and summer of 1998.

At the same time we have been filming, we have been gathering and analyzing the relevant statutes and regulations concerning nuisance law, right to farm law, anti-corporate farming law, environmental and odor regulations within each of the 13 southern states. We have also gathered all relevant statutes and other information concerning mediation and conflict resolution programs within these southern states and other model states. The written materials will be prepared for dissemination with the video.

Outcomes and accomplishments

We have been able to gain tremendous insight into the conflict involved in rural communities concerning the issues of nuisances and the influx of large agribusiness concerns. The issues are extremely complex. Local folks have been extremely willing to discuss their concerns with us on camera. Local and state legislative leaders and policy makers likewise have been extremely willing to discuss the issues. However, the least willing to discuss the issues are the large agribusiness concerns. They tend to be highly suspicious of the project and extremely reluctant to participate in a piece, even though educational in nature, which has any potential for reflecting poorly on their industry.

Dissemination of outcomes

We will be disseminating the video and written materials to a few installations within each of the southern states, that final list as yet incomplete. We may have some financial constraint in terms of our desires for dissemination and our realities for dissemination. We plan to advertise the product in every conceivable publication in order to let the public and agriculture professionals know of its existence. In addition, we plan to offer its viewing with the major agricultural professional groups in the region. We will be doing news articles announcing its release and have already received an offer from a major farm publication to review the video for their publication. We, of course, will need to work with the granting institutions on this aspect of the project.

Impacts and contributions

If agriculture professionals know of the potential myriad of complex issues, many of which are legal and regulatory in nature, which they may face if agribusiness chooses to expand in a meaningful way within their state, they will be better prepared to advise the public, participate in policy decisions, and serve as resource persons for other agricultural professionals on the legal and policy issues involved and on community conflict resolution topics.

Trainee adoption

Since the project is as yet incomplete and not disseminated, the known impacts on participants is impossible to determine. We anticipate being able to make comment in this area for the final report.

Feedback

Again, since the project is not yet complete, this item is best left until the final report. We can make a preliminary report that we have been greeted almost unanimously by most components of the farming and ranching and rural communities in a warm and accepting manner and with a willingness to discuss the issues.

New hypotheses

For future video projects funded by SARE, we would suggest a few things. First, that the budgets be extremely flexible and fully cognizant of the increasing costs of video production. Our first cost estimate of production costs is achievable only with a limited scope of production (which we have made mid-stream course corrections in order to accomplish) and through use of publicly supported video production facilities. If we were to subcontract this production to a private operation, almost the entire grant amount would be taken in video production costs.

Second, this project may be best presented in a multi-region context. We found that there is considerable important activity in these issue arenas outside the Southern Region but felt restricted in our ability to film outside the region in any meaningful manner.

Finally, it is our observation that this type of learning method is extremely important; i.e., the audio-visual method. We hope that SARE continues to fund important video projects. It is a valuable method of getting the sustainable agriculture message out to an increased viewing audience.

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SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-20
New Project
December 1997

State Training in Integrated Erosion Control Systems

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Cooperators

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Objectives

1.) Improve producer involvement in sustainable agriculture training in Oklahoma consistent with the state strategic plan.

2.) Improve curriculum development related to erosion control in Oklahoma to strengthen the state strategic plan.

3.) Effectively train 120 professionals in Oklahoma in erosion control.

4.) Develop new integrated curriculum that could be used effectively in other training events with emphasis on distance learning methods

Approach

1.) Convene broad-based steering committee which would plan the interdisciplinary training curriculum. The steering committee was designed to comprise members from NRCS, Conservation Districts, Extension, producer associations, and producers. The group met November 13 and developed a prioritized set of target goals, constraints to programming, solutions to those constraints and methods for program delivery.

2.) Implement training program: Based on the steering committee recommendations, literature and hands on training sessions will be developed and implemented the next 6 months.

Project situation

A broad-based steering committee was developed to plan the interdisciplinary training curriculum. The steering committee was designed to comprise members from NRCS, Conservation Districts, Extension, producer associations, and producers. The group met November 13 and developed a prioritized set of target goals, constraints to programming, solutions to those constraints and methods for program delivery. Interesting comments that were generated include:

1.) Oklahoma Cooperative Extension has almost no materials focused on erosion reduction.

2.) Agencies are not effectively sharing information and improvement is definitely needed.

3.) Priorities were set on delivering information through various means.

Priorities were developed as well as well as dissemination plans. The next meeting will further develop the curriculum.

Impacts and accomplishments

Priorities set and an advisory committee established to develop and deliver the curriculum.

Feedback

Feedback from farmers/ranchers was excellent. Many were unsure that they would be heard or that this would be a meaningful exercise, but felt very good after the meeting and felt this was a critically important exercise to the sustainability of agriculture in Oklahoma.

Project duration
2 years

Budget:
SARE $80,013
ACE
Matching $51,710

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-21
Annual Report
December 1997

State Training Enhancement Project to Ensure Effective Sustainable Agriculture Training in Integrated Erosion Control Systems

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Cooperators

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Objectives

The training sessions were specifically targeted at addressing the following key objectievs of the State Strategic Plan:

1. Integrate agencies into developing and implementing sustainable agriculture education to Oklahoma's. Educational programs should have interdisciplinary and interagency focus within two years.
2. Educate 75% of Oklahoma producers in holistic integrated management principles and practices.
3. Provide training so 75% of Oklahoma land is utilizing a sustainable management system by the year 2001.
4. Further integrate marketing components into all educational efforts.

Six priorities were identified by outside groups:

i. integrated problem solving
ii. public education
iii. rural community revitilization
iv. impacts of government programs
v. interagency cooperation
vi. improved marketing education

Based on the steering committee recommendations, literature and hands-on training sessions will be developed and implemented focusing on bringing together public and private sustainable agriculture groups and focusing on producers as teachers.

Potential benefits and impacts

1.) Improved programming between agencies. Many said this was the first time they communicated in this area with NRCS, FSA, and NGOs.

2.) Improved understanding and comprehension on the way innovative producers have adopted sustainable agriculture concepts.

3.) Improved understanding of the emotional and scientific issues of human and animal waste issues.

4.) Feedback from farmers/ranchers was excellent.

Project duration

1 year

Budget:

SARE	$10,000
ACE	
Matching	$7,861

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-24
New Project
December 1997

Barriers to Sustainable Agriculture Training in Oklahoma

Project Coordinator
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Objectives

1.) To arrive at a definition or vision statement of the sustainable concept and how sustainable agriculture concept can be usefully applied to the benefit of Oklahoma agrultural rural and urban clientele. The sustainable agriculture vision for Oklahoma should be clearly communicated with faculty, staff, and all interested public clientele.

2.) To provide guidance on how sustainable agriculture concepts can be integrated with current educational and research programs in DASNR. This will include identifying areas of complimentarity with current programs, to suggest areas of additional programming, and to help set priorities for the allocation of increasingly scarce resources. One outcome of this objective would be to indicate how sustainable agriculture research and education fits in to the DASNR strategic plan.

Initial sustainable agriculture training efforts in Oklahoma have met with considerable resistance due to misconceptions and preexisting biases about what sustainable agriculture is and isn't. These negative connotations are made worse by the lack of a clearly stated definition of sustainable agriculture, in the context of mainstream commercial agriculture in Oklahoma, and the inability to demonstrate how sustainable agriculture concepts can be complimentary with, and extensions of, current programming efforts rather than a vastly different new program area. This proposal recognizes this as a major barrier and proposes a plan of action to overcome this obstacle as a prerequisite to future training in sustainable agriculture.

Project duration
1 year

Budget:
SARE $10,000
ACE
Matching $10,400

SARE
Sustainable Agriculture Research and Education
Southern Region

ES97-25
New project
December 1997

Building Capacity in Sustainable Agriculture: A Comprehensive Training Program in Organic Farming Systems

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Soil Science

Cubeta, Marc
Ristaino, Jean
Plant Pathology

Orr, David
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Walgengach, Jim
Entomology

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Luginbuhl, Jean-Marie
Mueller, Paul
Crop Science
All above NCSU

Cooperators continued on next page

Project duration 2 years

Budget:	
SARE	$ 97,500
ACE	
Matching	$ 20,592

Objectives

1.) Conduct a series of workshops for extension specialists, agents, mentor farmers(described below), consultants, NRCS employees, and other teaching professionals, emphasizing how the major components of organic production systems can be incorporated into a productive management system. A major focus of each workshop will be the integration of the various crop production factors into a working system. Participants will learn how to critically asses and evaluate farm needs in relation to sustainable agricultural practices.

Graduate credit through NCSU will be offered to those agents who participate in the entire series.

2.) Set up demonstrations at The Center for Environmental Farming Systems (organic unit), and on farms, to provide hands-on experiential learning opportunities in conjunction with each of the workshops.

3.) Integrate organic producers into the training by including tours of various farms,and including farmers with specific expertise as facilitators and trainers at the workshops. A tour to Rodale Institute has already been proposed for 1998 as an advanced training for ag agents, and will be integrated into this program.

4.) Develop a training manual which will include chapters from each of the workshops. These modules will not only include complete information on their respective topics, but also detailed examples of field demonstrations that participants can implement to aid them in training growers. The edited training manual will be made available to other States in the southern region.

5.) Establish a farmer-to-farmer mentorship program to utilize successful organicgrowers in training other prospective growers. Agents will also be encouraged to actively recruit interested farmers to participate in the mentorship program. The mentor farmers will be available to advise and offer support for the apprentice farmers. Mentor farmers will also be invited to attend the workshops to allow them to strengthen their expertise in various areas.

6.) Existing programs providing training on organic production will be incorporated into this program, in part, by providing funds for agents to attend these activities. These include the annual CFSA conference, annual organic vegetable schools in the western part of the state and in the piedmont, and farm tours in central, eastern, and western North Carolina.

As proposed in this grant, training of agents and other ag educators will begin in the Spring of 1998. As outlined in our timeline, this initial 8 months has been used to hire our training coordinator (July, 1997); meet with workshop facilitating teams to determine each workshops training plan, demonstration, schedule, and budget; initiate all fall-planted demonstrations; recruit agents to attend training; gain approval for receiving graduate credit for participation; coordinate a poster session at the annual Sustainable Agriculture Conference; and, solicit participation of agents from nearby states.

The 14 workshops have been organized into 6, two-day sessions which will begin in April and continue monthly through September. Several demonstrations have been initiated at the Center for Environmental Farming Systems and at other sites for use in the training. Already, 43 North Carolina agents have signed up for the entire series, while many others have signed up for individual sessions. Several Virginia and South Carolina agents have contacted us and will be attending many of the sessions. Approval has been received to offer the series for 4 graduate credits through the Department of Horticultural Science. We are working on cross-listing this class in several other departments because of the interdisciplinary nature of the workshop series. The Carolina Farm Stewardship Association s Sustainable Agriculture Conference was recently held and the poster session, with 30 presenters was very successful. Conference attendance was very high, with 425 registered.

Project situation

Consumer demand for organically produced food, and the desire by many farmers to eliminate chemical fertilizers and pesticides, is increasing the need for research and educational programs to support organic

farmers. In North Carolina, demand for organic produce greatly exceeds supply, and as a result, the markets rely on produce from California to meet their needs. A knowledgeable extension service will be able to provide training and support for the existing and prospective organic farmers in this and other southern states, which will aid these growers in retaining the market share in this region.

Nationwide, organic producers are the largest growth segment in agriculture today. According to the USDA, the number of organic farmers has almost doubled between the years of 1991 and 1994, increasing from 2,841 to 4,060. As reported in the Natural Foods Merchandiser, organic sales increased from $2.31 billion in 1994 to $2.8 billion in 1995. For the sixth straight year, the market for organic products has experienced greater than 20% growth.

The land grant universities and the extension service have been viewed by organic farmers as not responding to their needs . A recent survey in the *Journal of Sustainable Agriculture* reported that a major hindrance to adoption of sustainable agriculture is a lack of information from educational organizations like the CES. Because of this lack of support, organic growers have been forced to develop their own production systems through trial and error, often at great cost. Through this collaboration, we would like to demonstrate a commitment to these growers and a recognition that organic production is a viable industry. Also through this effort, cooperative extension agents in this state and other southern region states, will be provided with training material which will facilitate service to these organic growers over the long term.

Dissemination of outcomes

a. The demonstrations associated with each workshop will be available for all participants to use for their own training. Agents will also learn how to set up those demonstrations in their own counties.

b. The mentorship program will facilitate farmer-farmer interaction, exchange of information, and training among farmers interested in organic systems.

c. The training manual will be the most important avenue of dissemination.

Part of the reason that the Cooperative Extension Service has neglected organic growers has been a lack of educational materials available to agents. The workshops proposed in this project will result in an edited training manual that will provide agents and others with specific information about a wide variety of topics, in addition to a series of demonstrations that they can plan in their own counties. An additional important component will be lists of suppliers for various products, a directory of additional sources of information (people and publications), organic certification guidelines, and contacts for marketing organic produce, which CFSA has already published and continues to develop as new opportunities become available. The training manual will be made available to other States in the Southern Region.

Impacts

Extension agents traditionally have not been well-informed about sustainable agriculture or organic production, and they have therefore been unwilling to conduct Extension programming in this area. This training will provide them with information and resources they need to conduct such programming. If each agent we train, conducts programming for only 25 growers/year, the number of growers trained per year could easily exceed 1800. The expected impact will be more sustainable practices used on many North Carolina farms.

At a recent round-table discussion on opportunities in organic production, North Carolina agents declared that they need reliable educational resources in order to demonstrate organic production to their growers. Given appropriate resource materials from which to plan, prepare and implement educational programming and technology transfer to farm clientele, there seems to be considerable willingness on the part of the agents to both encourage and demonstrate organic farming systems. An increase in the availability of appropriate information at the county level would result in an increase in communication between agents and organic farmers, and adoption of both more sustainable farming practices and an increased consideration of organic cropping systems as alternatives to more traditional farm commodities. The training manual we will produce at the end of this will provide the agents with the resources they need to conduct training of their own. The training manual will have lasting impact. It will be made available to all 100 counties in NC, and given to new agents as they enter the system. The training manual will also be made available to other States in the Southern Region.

We will also encourage each workshop participant to identify at least two apprentice farmer, and one mentor farmer. The apprentices will work with mentor farmers, tour their farms, and be brought together to exchange information and ideas. The goal would be to provide support, through the educators and mentor farmers for the apprentice farmers. These apprentices in subsequent years, would serve as mentors as the county-based program builds.

Cooperators continued

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American Livestock Breeds Conserv.

Budreau, Mark
Warren Wilson College

Britt, Jim
Hannah Creek Farm
Haines, Kenny
Misty Morning Farm
Hartmann, Stefan
Black River Organic Farm
Hitt, Alex
Peregrine Farm

Kidd, Kathy
North Carolina Dept. of Agriculture

McDowell, Donald
Ag Education and Economics

Raczkowski, Charles
Reddy, M.R.
Natural Resources, All NC A&TSU

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Partner in Agriculture

O Farrell, Mark
Cooperative Extension
Chatham County

Sabella, John
Rodale Institute

Smith, Jim
Good Earth Organics

SARE
Sustainable Agriculture Research and Education
Southern Region

PG94-5
Annual Report
December 1997

Vegetable Marketing Strategies for a Small Farm Co-op

Project Coordinator

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Cooperators

SCSU
Small Farmers Technical Assistance and Training Project

Clemson University
Cooperative Extension Service

In order to succeed, farmers who belong to market co-ops must learn to supply produce year-round. They must also learn to apply techniques and strategies to market that produce. Such techniques and strategies include proper preparation, storage, packing and shipping.

Objectives

1.) Conduct a series of vegetable marketing workshops focusing on readying, transporting and marketing produce to commercial markets.

2.) Evaluate current marketing strategies to determine strengths and weaknesses.

3.) Develop an evaluation/assessment plan to determine the effectiveness of workshops and seminars.

4.) Host an annual demonstration marketing field day to include other farmers in the area and other cooperatives.

Approach

During this extended project, leaders are arranging with commercial vendors and agricultural service representatives to provide a co-op of 55 small farms with a series of workshops that focus on techniques for timely production and on preparing, transporting and marketing produce in a more profitable manner.

The project began with a workshop called *Sharing Information About My Farm*, which led co-op farmers to examine the ways they were currently marketing their produce and to note the strengths and weaknesses of those methods. This was followed by workshops entitled *Problems Facing Farmers Today* and *Financial Management Training*. The latter included sessions in computer training for farm management and presentations about sustainable agriculture.

A form is being designed and will be mailed to participants for their evaluation of the effectiveness of the workshops.

Results

Participants report that the workshops have fostered a positive attitude, and they are eager to learn new ways of marketing their produce. They are consulting more with each other about individual crops and about striving for consistent quality in the produce coming from co-op farms.

The computer workshop was particularly popular and has spurred requests for more training in farm record keeping by computer. The co-op is investigating the possibility of purchasing computers for this training.

Farmers are putting into practice the skills they are learning in the workshops. They pooled produce of consistent quality from their various farms and then loaded trucks to send their first shipment from South Carolina to Baltimore.

Co-op members anticipate that the changes will impact profits, but at this time it is still too early to tell. Future seminars will build on the strengths of the current strategies to develop a progressive marketing program.

Outreach

A total of 40 people attended the first workshops. The first marketing field day was attended by 19 people, including farmers from other communities. It was held at the Joseph Fields farm, which produces squash, strawberries, collards, cabbage and broccoli. The group was given a tour of the farm, which uses a combination of bed and row planting techniques. The pond and irrigation system were included in the tour.

Joseph Fields concentrated on squash for the marketing demonstration. He explained how to grade for color and size. After harvesting, the squash was placed in a wash water containing dish detergent and chlorine bleach. The bleach acted as a cleansing agent and the detergent imparted a shine. The squash was then placed in crates, ready to be transported. He explained that the squash blossoms are sometimes sold as a specialty item. The field day concluded with a meal at the Fields' home, where attendees discussed their own operations and exchanged ideas.

Project duration

3 years

Budget:

SARE	$10,000
Matching	$1,850

SARE
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Southern Region

PG95-20
Final Report
December 1997

No-Tillage Production of Transplanted Crops in High Cover Crop Residues

Project Coordinator

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Virginia Tech
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Fred Rogers
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Natural Resource
Conservation Service
Galax, VA

Project duration
2 years

Budget:
SARE $8,300
Matching $17,200

Due to increased regulations and loss of farmland, fewer acres in the South are available for production of transplanted crops (vegetables and tobacco) than in the past. Of the available acreage, some is not suitable for production because the slope is too great for conventional production practices.

In the early 1990s, a no-tillage (NT) system was developed for producing transplanted crops that, compared to conventional tillage (CT) methods, uses fewer chemicals, reduces erosion, utilizes cover crops for moisture management, and allows transplanting, spraying and harvesting at times when CT methods don't allow access to the field.

Objectives

Demonstrate NT, compared to CT, production systems for transplanted crops in three regions of Virginia.

Approach

Farmer cooperators with a sincere interest in NT production systems and a past history of farming excellence were selected by the project coordinators. Aiding in the selection were Cooperative Extension Service (CES) and Natural Resources Conservation Service (NRCS) agents in the three regions of Virginia (Mountain, Piedmont, and Coastal Plains)

Cover crops were seeded in the fall prior to summer transplanting of the vegetable crop. Efforts were made to produce high levels (2 to 4 tons dry matter/acre) of cover crop residues. Prior to transplanting, cover crops were sprayed with Gramoxone Extra and rolled, creating a flat uniformly thick cover of residues over the entire field.

In all cases, the NT vegetables were transplanted with a Subsurface Tiller-Transplanter (SST-T) that was originally developed by Dr. Ronald Morse of Virginia Tech University in the early 1990s. The SST-T has a high-clearance design to minimize dragging of crop residues and, in one pass across the field, it subsurface tills a narrow in-row area, sets the transplants in the narrow tilled strip, compacts the loosened soil around the transplant, and precision bands fertilizer on both sides of the row.

Results

Although weeds were often more severe in the NT fields, using one or a combination of the following cultural practices can successfully control weeds in NT fields: high-density (multiple row) plantings, pre-emergence and post-emergence herbicides, hand weeding, and NT cultivators. Soil temperatures are cooler under cover crop residues; thus early spring plantings are not advised, unless raised beds and/or in-row residue cleaners are used. Because cover crop mulches enhance soil moisture, incidence of slugs can be higher in NT systems. Use of slug baits and other treatments may be necessary if slug problems are severe.

The no-tillage system of transplanting crops (vegetables and tobacco) is a viable production option. When using the SST-T, establishment and survival of plants were excellent; in most cases, equal or better than that obtained in comparable conventional fields.

No-till crop yields are as high or higher than that found in CT fields, except in situations where weeds are not controlled in NT fields.

When weeds are adequately controlled, there are four distinct advantages of using NT systems versus. CT:

Soil and water are conserved. Less irrigation water is needed when using high-residue, NT systems.

Flexibility of field operations is increased. Because the soil is untilled (firm) and covered with crop residues, farmers have greater access to their fields following rain.

In unirrigated fields, high-residue mulches generally increase yields in dry years.

Fruit quality is often higher in NT fields because surface crop residues serve as a protective barrier between the fruit and soil, reducing rotting and blemishes.

Outreach

Outreach included four field days and production of a videotape and manual (in the final stages of preparation) entitled *The No-tillage Advantage–A Profitable and Sustainable Alternative for Transplanted Crops.* The four successful field days were held July 1996 at Hillsville (Mountain Region); July 1996 at Suffolk (Coastal Plains) Region; August 1996 at Williamsburg (Piedmont Region); October 1997 at Glade Spring (Mountain Region). An average of 35 farmers and agricultural service providers attended each field day.

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Southern Region

PG95-21
Annual Report
December 1997

Pecan IPM Using Black-Eyed Peas as a Trap Crop

Project Coordinator

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Stinkbugs occur throughout the South and cause kernel damage to pecans in all pecan growing states. In Texas, most stinkbug damage occurs August through November when stinkbugs move from nearby crops and weeds. Stinkbugs cause a direct loss of three to five percent of the economic returns from southern region pecans, although losses within individual orchards can reach 40 to 50 percent.

Using their needle-like mouthparts, stinkbugs pierce the pecan shells and feed on the maturing kernels. The resulting damage is a dark, sunken, bitter-tasting spot on the pecan kernel (kernel spot). Farmers are not paid for stinkbug damaged kernels.

Preliminary information suggests that small plantings of black-eyed peas in pecan orchards can help pecan growers manage stinkbugs. The bugs are attracted to the black-eyed peas on which they may feed preferentially, potentially reducing pecan kernel damage.

The grower's goal was to utilize the trap crops in one or more of four ways. They first used the trap crops to monitor populations of stink bugs (it is much easier to sample black-eyed peas than pecans). Second, they used the trap crops to attract and hold the stink bugs, thereby preventing nut damage. Third, if large numbers of stink bugs were found, the growers could spray the trap crop. By not spraying the trees, the growers would avoid creating the secondary pest outbreaks of aphids which commonly occur when broad spectrum insecticides are used on pecans in West Texas. Lastly, if stink bug populations in the orchard reached levels at which high levels of kernel damage were imminent, they could spray the trees, using the population levels in the trap crop as a decision making tool.

Objectives

Determine if black-eyed peas serve as a trap crop for stink bugs, reducing damage in pecan orchards.

Approach

The growers are using two orchards in this study. In the first, southern pea trap crops were established on about 1.5 percent of a 650-acre irrigated orchard in 1994 and 1995. The second orchard, 20 miles north of the first, was not planted with trap crops and was used as a control.

Each year, scouts sampled the pea trap crops on a regular basis with a standard (15-inch hoop) sweep net to determine stink bug species, infestation levels and population changes. They used this information to make management decisions on insecticide application.

At harvest, 100 samples of 20-22 nuts were taken at various distances from the trap crops to assess the activity and success of using trap crops to protect pecans from stink bug damage. Farm-wide levels of stink bug damage were estimated by pooling these data.

In 1994, eight cowpea trap crops of two rows with two beds/row (about five acres total) were established at 800 to 1,200 foot intervals. They were planted between the tree rows, ran the same length as the tree rows and were planted on July 19 and August 1. Sweep net samples were taken on September 12, 20, 23, 27 and October 7, averaging 2500 sweeps/sampling date (range 1,600 to 3,300). The growers applied no pesticides to either the pecans or the trap crops as a result of the sweep data.

The growers sampled pecans on October 21 and October 27 by taking approximately 100 nuts at 22 locations (total of 2409 nuts). They took four replications of 100+ nut samples at 0-10 feet, 90-110 feet and 290-310 feet from the cowpeas to assess how distance from the trap crop affected stink bug damage. Another set of samples were taken from 0-10 feet to 2000 feet from the cowpeas. They examined the sample nuts for evidence of stink bug damage.

In 1995, nine pink-eye purple-hull pea trap crops of 4 rows with one bed/row (about 10 acres total)were established at 800 to 1,200 foot intervals in the first orchard. The plantings were again established for the length of the tree rows in between the rows. The trap crops were planted on August 1 and 10. Sweep samples were taken on August 28, September 5, 11, 19, October 2, 9, 16 and 27. An average of 2255 sweeps were taken per sampling date (range 1,900 to 2,900). Using the sweep data as the basis for treatment decisions, no insecticides were applied to the trap crops or the trees.

Project duration

2 years

Budget:

SARE	$4,000
Matching	$4,098

The growers took nut samples from the trees planted with trap crops on October 31, November 10 and 18. Twenty samples of approximately 100 nuts (total of 2, 065) were taken. The growers took six samples at 90 to 128 feet, six samples at 290 to 317 feet, and two samples at 619 to 620 feet from the trap crops. As they did in 1994, they examined the nuts for stink bug damage.

No differences in stink bug damage to pecan kernels were observed 0, 100 and 300 feet from the trap crop plantings in either 1994 or 1995. The growers did note a trend toward increased damage at 600 feet from the tree rows.

The growers noted strong reductions in stink bug damage when comparing the orchard with trap crops to the orchard without trap crops. In 1994, the trap cropped pecans sustained only 70 percent of the damage sustained by the non trap cropped pecans. In 1995, a year with low stink bug problems in the region, the trap cropped pecans sustained 91 percent of the damage of the non-trap-cropped pecans.

The cowpeas used in the 1994 study performed well. They maintained good growth, leaf color, flowering, and pod set for 45 days. The pink-eye purple-hull peas used in the 1995 study were chlorotic (yellow) in spite of an expensive iron treatment. They demonstrated poor growth, blooming and pod set and were a poor choice for a trap crop planting in west Texas.

Results

When the growers compared the average dollar losses from stink bugs between the trap cropped sites and the non- trap-cropped sites they found that the non-trap-cropped sites sustained $29.29 more stink bug associated losses than did the trap-cropped orchards. It cost the growers approximately $2,112.50 (about $211.25/acre of peas) to establish and maintain the trap cropped peas. When spread over the 650 acres of the pecan farm being affected by the presence of the trap crops, the growers spent $3.25/acre (of pecans) to establish and maintain the trap crops. The growers determined for every dollar they spent establishing and maintaining the trap crops, they prevented $9.01 in kernel damage from stink bugs.

Outreach

At project completion, results will be published in the agricultural popular press (e.g., *Pecan South Magazine and Southwest Farm Press*) and newsletters. Project results will also be presented at the Texas Pecan Growers Association meeting, the Permian Basin Pecan Conference, and to the Southwestern Irrigated Pecan Growers.

SARE
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Southern Region

PG95-22
Final Report
December 1997

No-Till Grain Production for Soil and Moisture Conservation

Project Coordinator

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Junior Allard
Panhandle Implement

David Austin
PBI/Gordon

Collingwood Grain

Producers:
Glen Plunk
Delmar Plunk
David Harrison

In the early 1980s, the producer was using a rotation of wheat-fallow-wheat-grain sorghum in a conventional dryland tillage system. Because of declining farm profits he realized that farming sustainably was possible only if he made some significant changes to his operation.

At that time, little local research was available on utilizing and conserving water with no-till systems, so the producer experimented with his own system to boost yield and profitability through improved water utilization and conservation. By 1984, he had a workable system that could be used by other farmers. During the past 10 years, he has continued to fine-tune the system and help fellow producers adopt parts of it for their operations.

Objectives

1.) Demonstrate the effectiveness of dryland no-till management systems for water conservation.

2.) Instruct other farmers in the adoption of dryland no-till management systems to improve water conservation.

Results

This project is an ongoing field demonstration to show farmers that they can increase net profit with a no-till system that encourages water conservation. Past demonstrations have successfully shown other producers how to conserve water. With the increased importance of conservation compliance, no-till management will continue to be an important practice on both dryland and irrigated land.

Outreach

The producer conducts tours and workshops on his farm. He has done this annually since 1984, with about 300 people now attending. In 1995, he presented a no-till workshop and tour that featured information on residue management and moisture conservation. Included in the demonstrations were short seminars by extension personnel and university specialists, as well as presentations by other producers who have adopted this system.

Due to a severe drought and the loss of the local research and extension specialist, the annual workshop and tour was cancelled in 1996. The 1997 no-till workshop and tour, while attended by fewer farmers than in 1995, due partly to an admission charge to cover expenses that in the past came from the producer's pocket, was another success in his series of field days.

Project duration

2 years

Budget:

SARE	$9,818
Matching	$19,636

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Sustainable Agriculture Research and Education
Southern Region

PG95-23
Annual Report
December 1997

No-Till Cotton Production Using Best Management Practices

Project Coordinator

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Cooperators

Ernest Flint
Cooperative Extension
Mississippi

In the Central Hill region of Mississippi, cotton yields range from low levels of 350-500 pounds to higher levels of 700-1000 pounds per acre. Cotton yield in this area is closely tied to tillage and fertilization practices. However, these practices vary widely among producers.

Conventional deep tillage has not been shown to be consistently beneficial to cotton growth and has been implicated in increased rates of erosion. In terms of fertilizer application, it is imperative that timing, amount and method of application suit local conditions in order to acheive adequate yields while maintaining environmental quality. Over the past few years, research has shown that adequate yields can be achieved without increasing input costs, through the implementation of no-till practices and the judicious use of fertilizers. The most successful farmers who have adopted these practices have achieved yields of 1000 pounds per acre or more by using no-till management and the proper balance of fertilizer nutrients.

Objectives

1.) Compare no-tillage and conventional-tillage treatments, with and without covers of winter wheat, on cotton.

2.) Demonstrate project results to area farmers in an annual field day.

Approach

The main problem being addressed in this project is finding a practical and successful approach to the selection of tillage and nutrient management systems for soils common to the Central Hill region of Mississippi. This project is expected to require three years because of the transition of the fields from their currently disturbed condition to a realistic no-till condition. The producer is in the process of testing local findings that show conventional deep tillage is not consistently beneficial to cotton growth and development.

The three experimental treatments used in this project include conventional tillage, no tillage with a winter wheat cover and no tillage with a cover of volunteer vegetation. The volunteer vegetation was comprised primarily of three species: henbit (*Lamium amplexicaule),* mouse ear chickweed (*Cerastium vulgatum)* and annual bluegrass *(Poa annua).* The harvested strips measured 0.765 acre. The results from the first year of the trial are as follow.

SEED COTTON YIELDS lbs/ac

Treatment	1st Pick	2nd Pick	Total	Est. Lint*
No-tillage/ wheat cover	1732	457	2189	788
No-tillage/ Volunteer veg.	1863	522	2385	859
Conventional tillage	1928	457	2385	859

* The estimated lint yield per acre is based on a 36 percent lint turnout after ginning.

It is not unusual for the first year yields of no-till to be lower than those of conventional till. The fact that the no-till treatment with a winter cover of native vegetation produced the same yields as the conventional-till treatment leads the grower to believe it will do even better than conventional till next year.

Both no-till plots matured later than the conventionally tilled plot. The second picking from the no-till treatment with a wheat cover crop did not make up for the lower first picking, and the yield from this treatment was a little more than eight percent lower than the conventional tilled plot. However, the no-till plot with a cover of native vegetation exhibited the highest yield at second picking and exhibited a total yield equal to that of the conventionally tilled plot. The final data at the end of theproject will provide a more comprehensive look at the yeilds in the various treatments.

Outreach

The proposed test area is adjacent to a heavily traveled local road, and farmers from the community are able to watch the project's progress. Growers then discuss the project with the project cooperators to find out how the project is doing. Field days will be held during the second and third years of the project. Results of the test will also be published in local extension bulletins.

Project duration

3 years

Budget:

SARE	$8,295
Matching	$53,280

SARE
Sustainable Agriculture Research and Education
Southern Region

PG95-24
Annual Report
December 1997

Alternative Control of Soil Diseases in Vegetable Production

Project Coordinator

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Development of non-chemical controls for soil-borne pathogens are needed in the search for sustainable agricultural practices. Methods for growing a number of fresh market vegetables typically includes the practice of soil fumigation. This practice is required to control a number of soilborne plant diseases.

Recent research suggests that the application of organic wastes may reduce the incidence of several fungal and microbial diseases on vegetable crops. The application of dried or composted organic wastes (cabbage, grass clippings, food waste, etc.) has been suggested as an alternative method for currently used fumigation technology. For example, cabbage leaves have been implicated in the release of toxic chemicals upon decomposition. These compounds are believed to be released for a short time in minute amounts but may be highly effective in reducing soil-borne disease pathogens. If a practical application could be developed to utilize these compounds, producers would have a sustainable on-farm method of disease control.

Another promising control measure which does not require chemical fumigation is solarization. Typically, soil is solarized by placing a transparent plastic cover over the crop area during periods of greatest solar radiation. The trapped heat can potentially reach temperatures high enough to kill soil-borne disease agents.

Objectives

1.) Determine the efficacy of dried cabbage residue and grass clippings as a mulch for the control of soilborne pathogens.

2.) Determine the efficacy of soil solarization for the control of soil-borne pathogens.

Approach

Field plots (4 ft. x 150 ft.) will be prepared and dried cabbage residue and grass clippings will be spread over them. Other field plots of the same dimensions will be covered with clear plastic film. Strawberries followed by watermelons will be planted in the plots which will be monitored for pest and insect damage.

Outreach

Two field days will be held during the course of this study. The first will be in late summer and will focus on the use of solarization and organic amendments to prepare areas for annual strawberry production. The second field day will be held at the time of strawberry harvest. The focus of the second field day will be to discuss the success or failure of solarization and organic amendments in strawberry production.

Project duration
2 years

Budget:

SARE	$5,625
Matching	$4,060

SARE
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Southern Region

PG95-25
Annual Report
December 1997

Development of Potting Soil Mixes from Local Wastes

Project Coordinator

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Almond Tree/South Dade Nurseries in Dade County, Florida, requires a financially and environmentally sound substitute for the potting soil mix currently in use: a mixture of peat, pine bark and sand. Peat is expensive and depletes a natural resource that could be saved if a good quality substitute can be found.

Objectives

1.) Develop a potting soil mix from composted organic materials, including sewage sludge and organic waste products that have been source-separated from the rest of the refuse stream and are currently going to landfills and incinerators.

2.) Evaluate the potting soils for fertility, moisture rentention and performance in a greenhouse setting.

Approach

The producers are growing four varieties of nursery stock (green buttonwood, silver buttonwood, gumbo limbo and Christmas palm) in containers filled with the professional potting mix and also in containers filled with composted yard waste. The composted yard waste comes from a nearby municipality, which screens it for non-yard waste materials prior to delivery.

All of the plants in both sets of containers are fertilized identically with 16-4-8 fertilizer and also receive the same amounts of water. A pre-emergence herbicide is applied equally to both sets.

Results

After one year, the plants grown in the composted yard waste performed as well as those grown in the professional potting mix. Furthermore, the professional potting mix costs $21.28/cubic yard while the composted yard waste costs $15.00/cubic yard. These results are still preliminary, but the producer intends to use more composted yard waste as a potting medium in his nursery even before the project is completed.

Outreach

Field days, seminars and mailings will be used to disseminate information on the new potting mix. Once the producers have finished their project, they will educate the nursery community on the value of source-separated, clean, organic waste compost as a potting medium.

Project duration
3 years

Budget:
SARE $9,600
Matching $13,800

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Southern Region

PG95-26
Annual Report
December 1997

Testing the Efficacy of Alternative Methods of Whitefly Control in Organic Vegetable Production

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Cooperators

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Whiteflies, including the sweet potato whitefly, the silverleaf whitefly and the greenhouse whitefly attack a broad range of economically important vegetable and field crops, and have recently increased in importance in the western and southern United States. Whiteflies damage crops by feeding on plant sap. More importantly, whiteflies are capable of transmitting viruses to a wide range of crops.

Biogeographic surveys of whitefly populations from 1989 to the present indicate that whiteflies inhabit nearly every major agricultural locale in the southwestern and southeastern states and Hawaii. Economic crop losses due to whiteflies and their associated viruses have been especially significant in Florida, Georgia and South Carolina. An important factor responsible for the whitefly's prevalence in agricultural areas is its ability to feed, multiply and survive on an extremely wide range of host plants.

On their certified organic farm in Florida, the producers observed large whitefly populations during the entire cropping season. They experienced nearly 100 percent virus infection of snap beans and tomatillo. Overall, the viruses transmitted by whiteflies are their largest production problem.

Pesticide application is the most common method of whitefly control on conventional farms. However, organic farmers interested in alternative approaches have more limited methods available for whitefly control. In this research project, the producers will conduct an on-farm experiment to determine if an economically feasible control program utilizing an integrated pest management approach can be developed for small to medium-size farms.

Objectives

1.) Determine if the use of reflective mulches under beans is an effective means of whitefly control.

2.) Determine if intercropping beans with squash is an effective means of whitefly control on beans.

3.) Develop a botanical insecticide produced from extract of *Nicotiana gossei* and test it on squash as a control for whiteflies.

Approach

The plot size is 10 feet long with four treatments/plot. Each plot is replicated four times giving a total of 16 treatment-replications. The producers are comparing both the number of whiteflies and the percentage of virus infection on beans planted under the following treatments:

1.) beans planted on bare soil,

2.) beans planted on plastic mulch,

3.) beans intercropped with squash and planted on bare soil,

4.) beans intercropped with squash and planted on plastic mulch.

The squash is utilized as a trap crop planted with the beans because squash is very attractive towhiteflies. The beans are inspected for symptoms of viral infection on a weekly basis. Whiteflies are sampled once a week in the early morning when they are less active. At maturity, all of the bean plants are harvested and weighed for each treatment.

The first test the growers conducted provided inconclusive results due to a number of reasons including an early freeze. The results of the fall 1996, spring and fall 1997 tests will be reported in the 1998 Southern Region SARE Annual Report.

The producers did achieve adequate germination of *Nicotiana gossei* and attempted to prepare an aqueous solution of extract to apply it to squash plants to determine if it reduces whitefly incidence and the virus it carries. The problem that they discovered is that the plants did not produce enough biomass to make very much extract. The growers are working on that problem with trials in their greenhouse.

Outreach

Project results will be submitted to agriculture and plant pathology journals and papers presented at the Florida Plant Pathology Society or the Florida Entomological Society. The producers will hold a field day for local growers, extension workers and master gardeners.

Project duration
1 year

Budget:
SARE $5,200
Matching $1,875

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Southern Region

PG95-27
Annual Report
December 1997

High-Value, Small-Scale Sustainable Vegetable and Fruit Production Methods

Project Coordinator

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Project duration

3 years

Budget:
SARE $9,612
Matching $4,942

During the last decade many farmers have gone out of business, in part due to the rising costs of land, machinery, chemicals, fertilizer and seed. Young people are finding it increasingly difficult to make the capital investments necessary to enter farming. The producers will demonstrate that a sustainable profit may be made from as little as two acres and a few purchased organic fertilizers, using no chemicals or large machinery.

Objectives

1.) Demonstrate how to improve soil physical properties and fertility through the use of mulches and animal manure.

2.) Demonstrate that lowering farming inputs through the use of mulches and animal manure can increase economic sustainability.

Approach

The producers created an additional one-acre garden on their farm specifically for this project. They are planting a series of vegetable and fruit crops over three years. The crops are corn, sweet potatoes, cabbage, strawberries, watermelon, cantaloupe and butternut squash. The garden will be divided into four equal sections and fruit and vegetable crops will be rotated on the sections during the project.

During the first year of the project the growers experienced severe weed problems. The area chosen for the one-acre project garden had not been farmed for a number of years, and the mulches could not control the weeds. The weeds, primarily johnson grass, dock, and poke finally had to be cut by machine, a task the producers had hoped to avoid.

They plan to mulch two sections of the garden with hay and two sections with black plastic. The treatments will be reversed the following year. Soil fertility will be maintained with manure and the decaying hay. They will document soil inputs, changes in soil texture and fertility, results of treatments per crop, gross income and net income.

Outreach

One field day is planned after the first results are available, about half way through the project. Another one is scheduled near the project's completion date. The producers will work with the North Carolina Cooperative Extension Service and present their results at a public workshop at the extension office. The workshop will cover intensive gardening and organic methods. They will also present their results at the North Carolina Vegetable Growers Expo and at the Carolina Farm Stewardship Association Sustainable Agriculture Conference at the end of the third year. Results will be reported in the Carolina Farm Stewardship Association newsletter.

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Southern Region

PG95-28
Annual Report
December 1997

Improving Tropical Soils by Using Organic Wastes

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Amigos Agricultura Ecologica Santurce

Fundacion Ambientalista Osho

Tropical Sources

Ama a tu Gente Salva el Ambiente

Lake Carite in Puerto Rico is surrounded by forest and farmland. The farmers utilizing the land surrounding the lake grow citrus, coffee and bananas and some annual crops. Some of the fertilizers and pesticides used by the farmers are leached into the lake.

In many tropical ecosystems nutrients are held in the standing biomass and not in the soil. When the natural vegetation and nutrients are removed from the site, the fertility of the bare soil is low. In the absence of protection, the topsoil erodes, and the remaining soil does not respond well to fertilization. Consequently, the citrus crops are not responding to traditional fertilizer recommendations and fertilizer use is increasing.

The local fruit processing plant and poultry farm near the lake have waste disposal problems. The project seeks a practical solution to the plants' waste disposal dilemma and to the farmers' soil fertility problems.

Objectives

1.) Construct compost piles primarily of fruit waste and poultry manure with seaweed, sand, calcium carbonate and leaves.

2.) Demonstrate to area farmers how to build compost piles.

3.) Demonstrate to area farmers how to use compost to increase organic matter in their soil.

Approach

The compost piles are housed on a demonstration farm in wire-mesh sided structures with concrete floors and tin roofs. The piles are turned regularly. Temperature, humidity and pH are monitored in all the compost piles on the demonstration farm to ensure adequate composting. These compost piles will be used as controls against which the performance of the compost piles of the participating farmers' fields will be compared. In this way, a participating farmer's compost pile can be adjusted and improved to obtain a better compost. There are now 10 farmers participating in the project, six from the area and four from surrounding counties.

Results

In addition to obtaining fruit waste and poultry manure from local sources, the project coordinators also purchase cow manure because they have learned it is helpful to keep a large stock on hand for the project. They have also found that the addition of seaweed increased the nutrient content of the compost.

The compost piles constructed in the bins on the demonstration farm take nine weeks to mature. On some of the participating farms the compost piles produce fully useable compost after 12 weeks. The differences are likely due to composition and size of the piles and air temperature due to elevation. In all cases the piles are turned every 20 days.

Mature compost has been applied to citrus trees, used as a potting medium for nursery trees and as a soil amendment in vegetable gardens. In this ongoing project, the cooperators report that when compost was applied to citrus trees, chlorosis was corrected, and the general appearance of the trees improved.

Outreach

Farmers are invited to attend workshops about composting through notices posted in local extension and NRCS offices. The cooperators have held more than 20 workshops for area farmers. The average attendance has been 12 with up to 30 people attending some workshops.

Farmers who cultivate fragile land on the lake shore have been visited by project participants who tell them of the project and how they can benefit from it. The cooperators demonstrated composting to 200 people at an Earth Day gathering. They have received invitations from groups in other counties requesting demonstrations on compost pile construction. With the help of cooperating government agencies, printed material will be produced covering composting and organic farming methods.

Project duration

3 years

Budget:

SARE	$10,000
Matching	$20,400

SARE
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PG95-30
Annual Report
December 1997

Management of Artificial and Restored Wetlands to Improve Water Quality

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Wet detention basins are used to hold water and gradually release it, slowing runoff from agricultural areas into ecologically sensitive areas, including bodies of water. The slower runoff because of its time in the detension basin--is often lower in agriculturally loaded nutrients than if it had run directly into the sensitive area.

Many citrus growers and other producers lack specific knowledge of the water quality improvements and ecosystem benefits that wet detention basins provide to agricultural operations. Many growers also are skeptical that sustainable methods can be implemented in a manner that is both cost-effective and that enhances product quality. While growers understand how their field practices affect their product output and cash income, many have far less understanding of how they can affect the environment through sound management of wet detention basins on or near their operations.

Objectives

1.) Reduce nutrient loads entering a water body, through the restoration of an ecologically diverse wetland serving as a wet detention basin.

2.) Restore wetland functions and reduce direct pumping of drainage water into the wetland.

3.) Educate growers on the use of a wet detention basin.

Approach

The project will restore a 10.3-acre agricultural retention area and will include one shallow freshwater marsh, a hardwood swamp, a hardwood hammock, a native palm hammock, two deep ponds, and a transitional hydric flatwoods area.

Excavation and land grading will route pumped water from the grove through the different wetland types and into a major drainage canal. Vegetated broad-crested weirs will be used where possible for controlling water movement within the retention area.

Monitoring of water quality will be performed periodically for three years after wet detention basin installation. Monitoring of vegetation changes will be recorded with still photography and video by the Water Management District and the landowner for future reference and for educational activities.

Outreach

Field days are scheduled for months 16 and 36 of the project and at 48 months, one year after project completion. The field days will be directed toward landowners, conservation groups, consultants, local state and federal agencies, citrus growers and the general public. In addition, public outreach will include press releases, journal articles and extension publications.

Project duration

3 years

Budget:

SARE	$10,000
Matching	$140,200

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Sustainable Agriculture Research and Education
Southern Region

PG95-31
Annual Report
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Improving Quality of Slaughter Hogs as a Marketing Strategy for Small Producers

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The Bluegrass Pork Producers Association in East Central Kentucky is devoted to improving swine production through education and marketing. Because of a change in the marketing structure of slaughter hogs and the closure of two Kentucky packers, smaller producers have been forced to contract with low-volume auction markets. The lower volume markets pay them less than direct-market truckload lots to larger packers. By improving carcass quality, the producers involved with the project hope to receive higher prices from the lower volume auction markets.

Objectives

1.) Demonstrate the utility of ultrasound technology to improve carcass quality in slaughter hogs.

2.) Improve quality of slaughter hogs in the Bluegrass Pork Producers Group.

3.) Improve breeding consistency of swine in the Bluegrass Pork Producers Group.

Approach

Data were collected on fatback content and depth, loin depth and percent lean of each animal by extension personnel using ultrasound technology. The information was used to analyze the characteristics of participating producers' hogs to improve breeding and marketing. The ultrasound technology was applied to the selection of breeding gilts in the project. In the first part of the project, 476 gilts were weighed. Fat and loin depth also were measured at that time.

Ultrasound technology is most accurate in predicting desired characteristics of offspring when it is used on young animals approximately 160 days old and that weigh from 230 to 270 pounds. Because of this, only gilts were used for this project. The boars used by all of the producer members of the Bluegrass Pork Producers Association who participated in the ultrasound breeding were purchased. The purchased boars were selected on the criteria developed and identified through the use of ultrasound technology. Consequently, all offspring are the result of selection for desired characteristics in both parents.

The ultrasound technician measured the desired characteristics of fatback content and depth, loin depth and percent lean over the tenth rib of each animal. The same technician operates the ultrasound machine for the program throughout Kentucky. This ensures no differences in readings due to different operators. Information from each animal is entered into a computer and used to develop an index which includes the age and weight of each animal. A final report on this project will be presented at project completion.

Outreach

A field day was held in conjunction with the annual Bluegrass Hog Show in Paris, Kentucky, in January 1996. The ultrasound evaluation and computer program were demonstrated on the 143 hogs in the show. Thirty three area producers and more than 100 4-H and FFA youth took part in the demonstration and judging contest. Another field day will be held at the completion of the project.

Project duration

3 years

Budget:
SARE $9,150
Matching $17,300

SARE
Sustainable Agriculture Research and Education
Southern Region

PG95-32
Annual Report
December 1997

Native Pecan Orchard Management Using Best Management Practices

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Native pecan trees predominate in the Red River Bottoms of Arkansas and are typically unmanaged. Since native pecans do not require extensive use of pesticides, as improved varieties do, production of these groves can potentially increase with only minor changes such as the application of fertilizers and the removal of plant debris under them. Production and harvest of native pecans in the area could potentially provide significant supplemental income for producers.

Objectives

1.) Identify native pecan trees capable of bearing marketable nuts.

2.) Demonstrate management practices in native pecan orchards to increase production.

Approach

The producer has, to date, identified and marked 600 individual native pecan trees capable of bearing nuts of marketable value. After identifying the trees to be kept, he removed the trees identified as non-productive. Next he concentrated on orchard sanitation, removing all twigs, tree litter and damaged nuts. He also kept the grass cover clipped. He practices this degree of orchard sanitation in order to reduce the potential of insect buildup.

Tissue and soil samples for analysis were collected around the trees at designated sites. Fertilizer was applied to designated trees based on the soil and tissue results. The silt loam soils required little fertilization. Nevertheless, the foliar tests did point up some nutrient deficiencies. Consequently, the grower applied zinc in the form of $ZnSO_4$ to the soil around the trees at the rate of 100 lbs/acre. He also applied 13-13-13 (NPK) at the rate of 350 lbs/acre.

The producer also tried a different method of fertilizing some of the trees, using broiler litter at the rate of one - two tons/acre. He timed this for the early spring so that nutrients in the litter were available during the summer months. The grower has found that the application of broiler litter has increased the production of many older trees.

Results

Yields in 1996 were 40 lbs nuts/tree from the younger trees and 85 lbs nuts/tree on the older mature native trees. The grower markets the nuts through a local broker in Texarkana, Arkansas. The nuts are cleaned, graded and bagged for sale to several candy companies and confectionaries.

The grower receives an average of 65 to 75 cents/lb, but he has sold pecans for as little as 30 cents/lb to as much as $1.27/lb wholesale. He expects to make money on this project because his out-of-pocket production costs are about 35 cents/lb. A final project report will discuss further results.

Outreach

The farm was featured in the March 1995 issue of *Progressive Farmer* magazine. Designated areas of identified trees are used as demonstration sites. The cooperators have conducted tours for local producers interested in this type of production system. They have provided information to approximately 23 area growers. Project results will be published in the *Delta Farm Press, Arkansas Farmer* and the *Lafayette County Democrat.* A field day will be held to teach local producers how to increase native pecan production on their farms.

Project duration

2 years

Budget:

SARE	$5,986
Matching	$13,700

SARE
Sustainable Agriculture Research and Education
Southern Region

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Cover Crops in Integrated Vegetable Production Systems

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Lexington County
South Carolina

Lexington County, South Carolina is a major vegetable producing area. Around 4,000 acres of collard greens, green onions, squash, tomatoes and beans are produced annually. Cover crops are needed to reduce soil losses and improve soil conditions. The current vegetable cropping systems used on much of the land in the county contribute to the loss of seven to eight tons of soil per acre annually. The soils are deep and sandy, requiring high irrigation rates. Because of this, high rates of nitrogen are applied and lost.

Winter cover crops could be used to reduce erosion. Cover crops would also reduce nitrogen losses (by using a nitrogen-fixing species less nitrogen fertilizer would have to be applied), improve organic matter levels, soil texture, soil structure and water-holding capacity.

Cover crops can potentially control certain diseases through their place in a rotation, but some studies have indicated that the incidence of root-knot nematodes and diseases caused by *Pythium* and *Rhizoctonia* can increase following certain cover crops.

Objectives

1.) Test treatments of the cover crops: rye, oats, rye + crimson clover, rye + cahaba vetch, crimson clover, cahaba vetch, hairy vetch, Austrian winter pea, arrowleaf clover and a fallow to control erosion and improve soil fertility.

2.) Determine if any of these cover crops encourage the growth of plant diseases caused by *Rhizoctonia* and *Pythium.*

Approach

The cover crop treatments will be planted in a randomized complete block design replicated four times. Soil will be tested for pH, nitrogen, physical properties, nematodes and Rhizoctonia and Pythium. Crop dry weight, N content and disease incidence will be observed and recorded.

Preliminary trials show that cover crops can potentially control certain diseases through their placement in a rotation. The incidence of root-knot nematodes have been very low in all the cover crops. Preliminary observations also indicate that *Rhizoctonia solani* counts in all cover crop treatments have decreased. However, *Fusarium* counts have increased slightly over the life of the project, but the analyses to separate the counts of pathogenic from non-pathogenic *Fusarium* species have not yet been performed.

Outreach

A field day will be sponsored by local seed companies at the termination of the project. An extension fact sheet and newsletter will also be produced and disseminated upon project completion.

Project duration

3 years

Budget:

SARE	$9,285
Matching	$11,315

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Hydroponic Vegetable Production in Conjunction with a Trout Farming Operation

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Producers:
William Cable
Pat Battle

North Carolina is second only to Idaho in the production of commercially raised trout. Trout farms must comply with effluent discharge regulations administered by the Division of Environmental Management within the Department of Environment, Health and Natural Resources. While most trout farms are able to comply with current regulations, the potential for more stringent regulation exists. This producer is situated on a tributary of the South Toe River which has a Clean River designation.

Effluent from trout farms is rich in nutrients. These nutrients can be a source of pollution if allowed to enter a waterway, or they can be a source of nutrients for effluent irrigated plants.

Objectives

1.) Use the drainage effluent from trout ponds to fertigate vegetables and greens.

2.) Adapt tobacco-grower static float-bed and tray system for greenhouse vegetable growing.

3.) Adapt flow-through greenhouse hydroponic system to use drainage effluent from trout ponds.

Approach

The producer is preparing a greenhouse site, constructing two small greenhouses (one for a static system and one for a flow-through system) and installing hydroponic and float-bed systems. Once the greenhouses and the float-bed systems are operational, the nutrients, air and water temperatures from the pond and the raceway systems will be tested and monitored. Thereafter, vegetables and greens will be grown in these systems throughout the three years of the project.

Outreach

The information produced from this project will be communicated through workshops and conferences with trout producers in the area. The producer has given a workshop and produced a poster on this project for two Carolina Farm Stewardship Conferences. When the project is completed, articles will be produced for Extension newsletters and the bimonthly newsletter of *Rural Voice for Peace.*

Project duration

3 years

Budget:	
SARE	$9,975
Matching	$6,425

SARE
Sustainable Agriculture Research and Education
Southern Region

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Annual Report
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Aquaculture Conversion Model Emphasizing Poultry and Hog Facilities Re-Use and Recycled On-Farm Resources

Project Coordinator

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As vertical integration increasingly dominates the poultry and hog industries, more farmers undertake huge debt to erect single-use livestock confinement barns in order to contract for poultry or hog production. They often mortgage home and land to meet the integrator's demand for state-of-the-art facilities in order to secure a contract. Then for a number of reasons, often beyond their control, growers find themselves with empty single-use buildings.

This grower seeks to develop a viable alternative use for livestock concentration facilities. Using empty hog barns, he will demonstrate a conversion strategy for indoor production of farm-raised fish. He will use tanks made from common "found materials" and affordable supplies readily available to the farmer.

Objectives

1.) Utilize climate-controlled former livestock barns to house fish tanks made from readily available supplies, and raise fish as an alternative to livestock production.

2.) Use fish manure to fertilize cropland adjacent to fish production tanks.

Approach

One commercial fish tank will be constructed from a disassembled galvanized grain bin and a swimming pool liner. Fish will be produced in a closed recirculating aquaculture system. The system will capture fish manure by filtration and hold it in a sand-bed tank.

A second commercial fish tank also will be constructed from a disassembled galvanized grain bin and a swimming pool liner. The second fish tank will be located in the same building as the first tank. The second tank will utilize a semi-closed system recirculating the water through underground piping to a pond on the farm. The fish tanks will be housed in climate-controlled buildings formerly used for hog production.

Tilapia, and possibly trout (as the weather cools) will be raised in the tanks. The fish manure from the first tank will be applied to adjacent crop land.

Outreach

Farm tours will be given to school groups, farmers and other interested people. A home page for the project will be established and maintained on the World Wide Web. Benny Bunting will present information on the project at conferences of North Carolina SAWG and its member organizations when the project has been completed.

Project duration

2 years

Budget:

SARE	$6,000
Matching	$74,064

SARE
Sustainable Agriculture Research and Education
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Annual Report
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Native Warm Season Grasses As Alternative Hay Source to Annual Sorghum/Sudan Grasses on Family-Operated Goat Dairy

Project Coordinator

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Travis County

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One of the primary reasons for the disappearance of the family farm is the difficulty of maintaining a cash flow. Modern agriculture tends to be cash intensive but produces low profit margins. Consequently, farmers often have to accept a reduced standard of living in order to keep their farms. Under such financial constraints, farmers who would like to practice environmentally sound farming often feel they can't afford to try it.

Farmers are always looking for ways to increase income. One alternative is the use of range land to raise meat or dairy goats. Dairy goats provide an array of products including meat, milk, and cheese. The nature of the dairy goat makes participation in all aspects of the dairy possible by family members of all ages. Unfortunately, few small dairy goat operations survive the first five years.

High labor cost is one of the reasons for the poor survival rates. The labor requirements for dairying in general, and for dairy goats in particular, are high. Approximately 12 goats must be milked to yield 100 pounds of milk, but only 1.5 to 2 cows are needed to produce the same amount.

Paradoxically, families who are willing to make the labor commitment to a small scale dairy operation are often under capitalized. One of the cash requirements for a dairy operation is feed. The producer believes the use of perennial grasses will lower feed costs.

Once established, perennials eliminate the yearly purchases of seed, yearly tillage costs, chemical herbicides and replanting expenses. Native warm-season perennials are reputed to require less water and fertilizer than annuals and produce more biomass per acre. Due to deep and extensive root systems they are also believed to be quite drought tolerant.

This producer proposes to lower the cost of feed in order to increase the longevity of her small-scale dairy. She will do this by reducing total inputs and by improving the productivity of the land by using native warm-season perennial grass crops as sources of hay for her dairy.

Objectives

1.) Determine if warm season perennial grasses that mature at successive dates throughout the season will produce more, and better quality, hay for dairy goats than does the currently used sorghum/sudan cross.

Approach

The producer will plant a thirty-acre plot of sorghum/sudan grass cross. She will harvest it and feed it to her dairy goats. She will also plant three 10-acre plots with one of the following warm season grasses respectively; *Tripsacum dactyloides* (eastern gamma grass), *Sorghastrum nutans* (indian grass) and *Panicum virgatum* (switch grass). The three warm season grasses will be harvested as hay (in boot stage) and fed to dairy goats.

The producer will take soil samples from the plots prior to planting and after harvests of all grasses and analyze them for pH, CEC, nitrogen, phosphorus, potassium and some micronutrients. She will take samples from all hay species and analyze them for yield, protein content, macronutrients and some micronutrients.

She will keep records of monthly sampling of percent butterfat, percent protein and total production, of milk from goats fed the sorghum/sudan cross hay for one lactation cycle (one year) and then hay from the three warm season perennials for one lactation cycle (one year). She will also keep records of costs associated with production of hay from all types of grasses.

Outreach

A dairy goat field day will be held in cooperation with the Texas Agricultural Extension Service for Travis County. The field day will offer practical information on the impact of perennial grasses on the economics of a small-scale dairy. Attendees will be able to view demonstration plots of warm season perennial grasses. A publication summarizing the project will be submitted to an appropriate journal when the project has been completed.

Project duration

3 years

Budget:

SARE	$9,640
Matching	$13,169

SARE
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Identification of Cover Crops to Enhance Habitat for Specific Beneficial Insects in Sustainable Production Systems

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Farmers are reporting great success in California in their efforts to reduce both the need for insecticides and for the repeated release of beneficial insects. They have accomplished this by developing plant mixes that attract and retain beneficial insects and by sowing and mowing these mixes at the appropriate times during the growing seasons.

There is great potential for similar programs in North Carolina. However, there is little information available in the region on relationships between specific beneficial insects and the appropriate plant species that would attract and retain them. The producer intends to develop this type of information. If successful, he believes that there would be great potential for local production of cover crop seed mixes and the consequent reduction in the use of insecticides.

Objectives

1.) Develop information on selected cover crop species that can provide habitat for beneficial insects for vegetable production and a cotton-peanut rotation in North Carolina.

2.) Determine if inserting the selected cover crops into existing vegetable and/or peanut-cotton rotation increases the presence and activity of beneficial insects and reduces the need for intervention.

Approach

The grower has put together a team consisting of a farmer, several extension agents, a non-profit representative, a cover crop researcher and an entomologist. They will conduct a database search to find references to cover crops, cover crop mixes and their associated beneficial insects, and management schemes for the crops/mixes and beneficial insects. In this search they will look for what has been done with cover crop/beneficial insect systems in other regions.

Based on the advice from this team of experts, the grower will select plants with the appropriate suite of potential beneficial insects and select the best planting dates. The team will meet six times throughout the life of project. They will develop proper planting schedules, rates, spacing and monitoring procedures. The grower will use an experimental design to ensure that the results are due to the experimental treatments rather than to random chance. The grower will plant the selected species and varieties and keep records of all project activities.

The grower will recruit farmers and insect scouts to attend joint NCDA and NCSU scouting training. From this process a scout will be trained to conduct bi-weekly insect monitoring, scouting and evaluation throughout two growing seasons. The grower will document all stages of the project with videotape and/or slides.

Outreach

When the project is completed the team will host a field day with farmers recruited from all the commodities involved. The grower will participate in conferences, distribute press releases and conduct other outreach activities as identified by the team of experts.

Project duration

2 years

Budget:

SARE	$8,452
Matching	$5,750

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Multiple On-Farm Use of Aquatic Plants and Animals

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Many small farmers find it difficult to earn a living wage. Moreover, the increasing costs of farming and low return on capital make it difficult for new farmers to get started. The grower has designed a project that will help overcome these barriers by utilizing existing ponds and water sources to grow aquatic plants and animals.

Many farms already have ponds or water sources that are seldom utilized for growing cash crops. Many different aquatic plants have economic value as food for human consumption, animal fodder, and for sale as garden ornamentals. Furthermore, aquatic and bog plants are some of the best known filters for purifying water, and they also recycle nutrients. This is increasingly important for farms that raise livestock or have problems with nutrient leaching and runoff.

Objectives

1.) Improve water quality and decrease input costs by using aquatic plants to recycle nutrients and water back into the farm system.

2.) Increase farm income by using aquatic plants and animals as additional cash crops.

Approach

This project will recycle runoff from animal pens, and domestic greywater through a series of filter beds, utilizing aquatic plants, to capture nutrients and cleanse the water.

The grower will develop a duck/tilapia/aquatic plant system in which the ducks and tilapia eat the aquatic plants. In turn, the ducks and tilapia will fertilize the water and the aquatic plants.

The grower will use some aquatic plants (water hyacinths and duckweed) as alternative feed for pigs and chickens. He will market other aquatic plants as vegetables (duck potato, watercress, water spinach, water chestnut) and ornamentals (water lilies, lotus, water lettuce, bulrushes).

Outreach

The grower will conduct a field day and workshop when the project is completed. He will submit the results of the project to permaculture journal and farm publications. The results will be publicized through the local extension service.

Project duration
2 years

Budget:

SARE	$9,575
Matching	$12,100

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Group Strategic Alliances for Carroll County Feeder Calves

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Carroll County, Kentucky, is located on the Ohio River halfway between Louisville, Kentucky and Cincinnati, Ohio. In 1994, over 93 percent of crop receipts for the county came from tobacco. Thesetobacco growers report that they are under pressure to consider alternative or supplemental crops to tobacco. However, Carroll County has a unique combination of barriers that make trying alternatives difficult. Once you leave the bottoms, the slopes get quite steep—71 percent of the land has slopes of 12 percent or greater. Because of the county's prime river location, farming is giving way to industry on that land.

The Carroll County Cattlemen's Association (CCCA) has concluded that livestock produces the best supplemental income, given their reliance on tobacco and their particular geographic and economic circumstances. They have determined that in order for producers to increase their incomes from cattle they must be willing to do two things: 1.) provide a favorable product and 2.) try marketing alternatives.

The Carroll County Cattlemen's Association will make their cattle more marketable by improving the carcass quality through breeding and management systems. By forming marketing groups, they hope to be in a better bargaining position with feedlots and packers.

Objectives

1.) Identify breeding and management systems that improve carcass quality and facilitate marketing of cattle by the Carroll County Cattlemen's Association.

2.) Develop standards for marketing cattle from Carroll County, Kentucky, during the next five years.

3.) Develop marketing contacts for the Carrol County Cattlemen's Association (CCCA).

Approach

The CCCA will gather growth and feed data on each calf. This will take two breeding seasons (approximately 18 to 20 months). During the first year, all CCCA producers will complete a Total Quality Management program. The program will cover five areas of beef production: 1) issue awareness 2) preventative health practices, cattle working facilities and animal handling techniques 3) breeding management 4) nutrition and health 5) marketing.

All CCCA producers will complete questionnaires identifying current management practices, breeding background of their cow herds, personal goals for their beef cattle program, what they want to accomplish by participating in the project and the investment they will need to make in bulls and facilities. Producers will also be required to utilize

Cow Herd Appraisal Software (CHAPS) and will be instructed on its use.

A committee from the CCCA will develop a program for each producer that will enumerate breeding, nutrition, management and health programs in order to create uniform lots of cattle. Contracts between the CCCA and each producer will be drawn to provide the producer with detailed instructions to develop his or her herd to CCCA standards.

Outreach

The CCCA will conduct marketing field days in conjunction with the Kentucky Department of Agriculture Marketing Division. These field days will showcase the cattle being marketed. Extension specialists will share the program information during producer workshops throughout the state when the program is completed.

Project duration
2 years

Budget:

SARE	$10,000
Matching	$58,700

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Technical Assistance for Meat Goat Marketing

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The major cash crop in Owsley County, Kentucky is tobacco and its production has been declining. A study conducted by the Kentucky Long Term Policy Research Center has predicted that in the 10 years from 1993 to 2003 tobacco production will decline by 41 percent.

A group of concerned citizens serving as the Owsley County Action Team joined together to study sustainable alternatives for their area. They identified meat goat production and marketing in the eastern coastline region as one alternative. The East Kentucky Goat Producers Association (EKGPA) was formed to further develop this alternative.

While the EKGPA is convinced the potential for meat goat production exists, information about marketing is scarce. Consequently, the EKGPA has decided that research into marketing is needed for meat goat production to be successful in Owsley County.

Objectives

1.) Promote the efforts of the EKGPA to educate farmers and prospective farmers on meat goat production and marketing.

2.) Demonstrate proper artificial insemination methods, selection of meat goat varieties, goat management and pasture management through field days and publications.

3.) Visit and network with goat producers, marketers, slaughterhouses and processing plants to learn about the latest meat goat management, marketing technology and potential markets.

Approach

The EKGPA will write and submit a series of newspaper articles describing their planned activities and inviting participation. They will attend Southeast Regional Meat Goat Association meetings to develop contacts and learn the newest technologies and marketing ideas. They will then conduct a goat farming workshop.

The EKGPA will conduct field days on artificial insemination and conduct pasture management demonstration projects. They will then analyze the data from pasture management demonstration projects. Following the data analysis they will conduct a field day on pasture management. They will also visit slaughterhouses and processing plants in order to thoroughly understand market criteria they will have to meet.

Outreach

The EKGPA will produce a brochure and newsletter of their activities. They will also publish and distribute a handbook of information on meat goat production and marketing in eastern Kentucky.

Project duration

2 years

Budget:

SARE	$8,900
Matching	$4,062

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Grasslands Matua and Grasslands Gala in the Tennessee Valley as an Alternative to Fescue and Ryegrass

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Soil erosion concerns and the desire of farmers to lower input costs have increased demand for new species and varieties of forage grasses. New forage species from New Zealand and from the western United States have been introduced, but research on their suitability for the southern United States is scarce.

Two exotic grasses (Grasslands Matua and Grasslands Gala) have been touted as alternatives to fescue and ryegrass. In addition, Gala is reputed to exhibit nearly 12 month growth in the south and withstand intense grazing with quick recovery.

The producer will test the suitability of the two grasses for his dairy operation in an effort to identify alternatives to ryegrass and fescue in the south.

Objectives

1.) Determine if *Bromus Willdenowii* (kunth) prairie grass (Grasslands Matua) and *Bromus Stamineus* Desv. (Grasslands Gala) produce acceptable forage for dairy cows, especially during the hot and humid months.

2.) Determine if Grasslands Matua and Grasslands Gala can be used as an alternative to fescue and ryegrass.

Approach

The farmer will establish two acres each of Grasslands Matua and Grasslands Gala as well as corresponding plots of fescue and ryegrass. Four groups of approximately 10 cows will be grazed on the four plots i.e., one group each on Matua, Gala, ryegrass and fescue.

On a one- to two-week schedule he will take grass samples from all four plots. They will be analyzed for forage quality including protein content, macronutrients and some micronutrients. Percent butterfat, percent protein and total milk production from cows grazed on all four plots also will be analyzed. The grower will measure biomass since this will provide total production data and is the actual measure of what will be available to his cows.

Outreach

At the end of the project the producer will prepare a publication of the project results. He will also conduct a tour stop for the local Cattleman's Association fall field day to discuss the project and results. He will also disseminate project data when he attends other field days and meetings.

Project duration

3 years

Budget:

SARE	$9,900
Matching	$4,050

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Low Input Sustainable Agriculture Short Course

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Gardening Program

The number of farmers has declined in the Chattanooga, Tennessee, area. There is also a lack of information supporting sustainable agriculture techniques for existing and prospective farmers. This grower proposes to address the decrease in the number of farmers by developing a workshop on sustainable agriculture that will help beginning farmers succeed.

Area supermarkets acquire nearly all of their fresh produce and meat through distribution systems that buy from suppliers all over the world. Not surprisingly, there are only two market farmers in the Chattanooga area. Both are certified organic growers who produce a variety of fruits and vegetables. A small number of specialty farmers continue to produce fresh fruit on a limited basis.

The grower will plan, market and conduct a comprehensive short course on sustainable agriculture in the Chattanooga area. Through this course he will emphasize intensive farming practices utilizing low inputs for small and limited-resource farmers.

This project will directly address the problem of the decreasing agricultural base in the area. By providing sustainable agriculture options for those wishing to enter agriculture as a career, he will expand the availability of fresh local food for the Chattanooga area.

Objectives

1.) Conduct a 40-hour short course on low-input sustainable agriculture for existing large- and small-scale farmers and to potential farmers.

2.) Communicate issues linked to agriculture through farmers, land-use planners and conservationists.

Approach

The short course is designed to include information on plant physiology, soil texture and structure, crop planning and rotation, planting and tillage techniques, composting, organic pest management and marketing. The techniques are part of a total system showing course participants how to grow more food per acre.

Results

The section on tillage practices demonstrated how to improve crop yield by increasing soil fertility, texture, structure and organic matter. It covered the use of compost and how to make it from animal manures and crop residues. The unit on pest control integrated biological controls with common cultural practices. The course also covered selective harvesting of hardwoods, preservation of habitat and use of native species.

The marketing section covered direct sales to consumers through farm stands, community supported agriculture (CSA) groups, farmers' markets and value-added products. The course stressed the use of on-farm resources and the reduction of off-farm inputs to increase net farm income.

Outreach

Information and results from the course is being distributed through press releases to local news media and by publication in each cooperator's newsletter. Cooperators will also distribute information about availability of local produce and generate further interest in the course. Projects initiated as a result of the course will be used for annual farm tours and as demonstration sites.

Project duration
2 years

Budget:
SARE $9,650
Matching $16,650

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Sustainable Cultivation of Medicinal Herbs as a Cash Crop Alternative to Tobacco

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This grower's small farm in Hawkins County in Northeast Tennessee is typical of many small farms throughout the southern appalachian region. This is particularly true with respect to the problems it faces in achieving and maintaining economic viability. These problems include:

* small tillable acreage
* marginal soils damaged by erosion and past management practices
* soils deficient in organic matter and available mineral nutrients
* declining revenue from, and uncertainty about future of, burley tobacco
* inability to make sufficient wages from farm income, requiring off-farm employment.

The majority of farmers in Tennessee rely on a small number of crops: tobacco, soybeans and corn as well as cattle. Many small farmers are looking for crops that can be grown as alternatives or additions to tobacco. The Tennessee Farm Bureau has informed growers that if they intend to grow alternative crops to tobacco they must consider the following challenges:

* Demand for some crops is limited
* Established producers are likely to resent new competition.
* Some crops are more apt to fail and more likely to experience wide price swings than others.
* Some crops won't grow well in particular soils or geographic regions.
* Local institutions may lack expertise with the crop, making advice and research scarce.
* There may be no way to effectively market the crop.

This producer plans to investigate the feasibility of growing *Echinacea purpurea,* purple coneflower as a cash crop in northeast Tennessee. He chose this herb for this project because:

* It has a high market value (sells for $7-$12 per pound.
* It has high expected crop yields. Estimates of up to 1200 pounds of dried root per acre have been obtained.
* There is a growing U.S. market and a very strong European market for E. purpurea.
* E. purpurea is a native plant species that is adapted to local conditions.
* It is adaptable to existing equipment and facilities of the region, e.g., tobacco barns, setters, cultivators, etc.
* It is highly adaptable to organic/sustainable growing methods.

Objectives

Determine the practicality and economic feasibility of producing organically grown *Echinacea purpurea*, a high-value cash crop, as an alternative to tobacco in northeast Tennessee.

Approach

The grower will keep detailed records on the amounts and types of compost, manures and cover crops used in the project. He will also determine the acreage harvested, average yield per acre, total crop production, marketing year average, and the total value of the production for *E. purpurea* and other medicinal herbs that show promise.

The grower will compile yield and production data on *E. purpurea* grown in east Tennessee. The grower will also compile tobacco production data from east Tennessee. This information, along with the tobacco cultivation results from the grower's farm, will be used as a control for the research to determine if growing *E. purpurea* can offer a practical and cost-effective alternative to tobacco in east Tennessee.

The project crop will be undersown with white dutch clover/ladino clover/native short grasses to keep down weeds and to serve as refugia for beneficial insects. The grower will monitor the crop for insects, both harmful and beneficial, disease, weeds, and response to climate and cultural practices.

Outreach

The grower will work with extension faculty to develop a handout on the cultivation of *E. purpurea*and other medicinal herbs. The handout will also cover pest and disease management and marketing. He will hold a field day in conjunction with the NRCS in Hawkins County and the Hawkins County Agricultural Extension agent. When the project is completed the grower and cooperators will submit papers to *Organic Gardening, Herb Quarterly, HerbalGram, Common Ground, Southern Sustainable Farming,* and *Tennessee Farm Bureau News.*

Project duration
3 years

Budget:
SARE $5,004
Matching $4,650

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Alternatives to Chemicals in the Peanut-Cotton Rotation

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The peanut-cotton rotation is the major production system for many farmers in eastern North Carolina. Cotton production alone increased 40 percent from 1994 to 1995, up to nearly 800,000 acres in North Carolina. One hundred and fifty thousand acres of peanuts are grown in North Carolina, primarily in 13 counties in the coastal plain.

The production of both peanuts and cotton are chemical intensive and costly. Thirty-three percent of the operating inputs in peanut production go to pesticides. Both peanut and cotton production depend on the use of chemicals, which are known or suspected carcinogens.

In the past, peanut growers who own or rent quota have been guaranteed a price based on the cost of production through the Federal Peanut Program. If the price of peanuts drops or the program is discontinued, a significant loss of income will result for farmers, and some of them could go out of business.

As growers have looked for ways to improve their cultural techniques, become more efficient, and stay competitive, many have adopted no-till methods of production. Peanut growers received some benefits from the switch to no-till production, but they had to increase use of chemicals.

This project will evaluate beneficial insects, cover crops and less toxic chemicals as alternatives for various chemical products currently used. For cotton, the grower will investigate the use of alternatives to Pix, a growth regulator which encourages the initiation of reproductive growth, and Def, a defoliant used just before harvest. For peanuts, the grower will investigate alternatives to Aldicarb (Temik), which is used for early-season thrips control. The farmer will evaluate sugar water to replace Pix, citric acid to replace Def, and beneficial mites and soaps to control thrips.

Objectives

1.) Determine the efficacy of using beneficial mites and soaps to control thrips on peanuts in eastern North Carolina.

2.) Determine the efficacy of using sugar water and citric acid to replace Pix (growth regulator which encourages initiation of reproductive growth) and Def (defoliant) respectively on cotton in eastern North Carolina.

Approach

Beneficial mites (to control thrips in peanuts) will be released in one-half of the experimental areas on the grower's farm and the farms of four project cooperators. Soap sprays (to control thrips in peanuts) will be used in the other half of the experimental areas on those farms.

The fields receiving these treatments will be monitored for amount of thrips damage and peanut yields. Since treatments will be adjoining, buffer strips will be used. Data on thrips damage and peanuts harvested from the experimental areas inside the buffer strips will not be used.

Sugar solution (as a growth regulator) will be applied to cotton in the pinhead square stage in experimental areas on the grower's farm and the farms of two cooperators. Sugar solution will be reapplied as needed. At 40 percent open bolls, citric acid solution will be applied as a defoliant to cotton in the experimental areas on the project farms. Citric acid will be reapplied as necessary.

The initiation of reproductive growth due to the application of the sugar solution will be compared with that caused by Pix. The amount of defoliation caused by citric acid applications will be determined and compared with the amount of defoliation caused by Def. Cotton yields from experimental areas will be determined and compared with yields in non-experimental areas. Buffer strips will be used, and data from the strips will not be included.

Outreach

At project completion the Cooperative Extension Service and the NRCS will publish the results of the project in agency newsletters as well as in local newspapers. In addition, they will hold field trips so that interested individuals can view the project. Project results will be disseminated through a series of farmer meetings organized throughout the region by RAFI-USA.

Project duration

2 years

Budget:
SARE $9,366
Matching $9,450

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Grazing Alternatives to Tall Fescue for Stocker Cattle

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Feeder/stocker cattle from the southeast are perceived by some buyers as lower quality and less healthy than cattle from other regions. This results in lower prices being offered to southeastern growers. Consequently, producing cost-efficient and healthy feeder cattle is a prime concern to growers.

Much research has been conducted on improving forage grasses, but there have been varying degrees of adoption in upper middle Tennessee. This is often because forage species developed as alternatives for other regions of the country usually have higher costs and/or increased management requirements over the commonly used tall fescue.

Tall fescue provides excellent production in the fall and spring but leaves much to be desired in the summer. When stocker cattle graze endophyte-infected tall fescue during the summer months, they generally exhibit reduced daily weight gains and a less desirable appearance. These cattle take longer to start gaining weight on rations at feedlots, have more health problems than those grazed on other forage and bring discounted prices.

The producer has noticed that even a limited introduction of crabgrass into a local tall fescue grazing system provides measurable improvement in marketability, summer weight gains, feedlot performance and profitability. Crabgrass is economical to produce, adaptable and naturally occurring. It has the potential to work well in rotations with wheat and ryegrass, eliminating the need to tie up land year-round to produce summer grazing as some other species require.

This producer intends to integrate forage species based on their seasonal production to provide maximum grazing. By blending forage species to suit land quality and area limitations he will be able to provide maximum grazing forage for his livestock.

Objectives

1.) Determine if a crabgrass (in summer) and wheat/ryegrass (in winter) forage for stocker cattle will reduce the cost of beef production and improve health, carcass quality and marketability over cattle grazed on endophyte-infected tall fescue in the southeastern United States.

Approach

Purchased stocker cattle will be randomly divided into two groups. Each group will be grazed rotationally on either tall fescue (with some clover lezpedeza) or crabgrass and wheat/ryegrass until they weigh approximately 750 pounds (3 - 6 months). The grazing rotations will be based on forage availability using temporary fencing where feasible.

Forage availability estimates will be determined and stocking rate data will be collected. Excess forages will be harvested as hay and total yield will be determined. The producer will take forage samples on a regular basis and analyze them to determine the nutritional quality of the two forage groups.

The producer will have the cattle weighed as they are sorted to a grazing system and thereafter at thirty day intervals. He will collect data on average daily weight gain, field feed conversion estimates, individual performance relative to initial efficiency, total feed conversion, carcass quality and other pertinent performance data of the stocker cattle.

Outreach

The producer will hold a field day focusing on the topics of forage and beef cattle. He will also arrange tours for agribusiness groups and producers from Tennessee and adjoining states. With the assistance of his cooperators he will prepare and distribute extension fact sheets on the results of the project.

Project duration
3 years

Budget:
SARE $9,982
Matching $79,114

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-46
New Project
December 1997

Sustainability Starts at Home: Building Regional Self Reliance Through Agritourism

Project Coordinator
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Ci Hart
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Joe Gragg
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Mark McLemore
Natural Bridge State Park

Michael Childress
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Susan G. Hobbs
Beattyville Enterprise

During 1996, farmers in the eastern Kentucky counties of Lee, Wolfe, Owsley, Powell, Estill and Menifee, working with Commodity Growers Cooperative, formed the Archway Regional Tourism Association (ARTA). The goals of ARTA are:

1.) Serve as a resource for area farmers by providing information and assistance on cooperative advertising through signs, brochures and other marketing campaigns and business-plan development;

2.) Ensure that the economic benefits of farming and agricultural tourism are documented and disseminated to the public;

3.) Create partnerships, to accomplish their goals, with local, state and federal agencies.

4.) Commodity Growers Cooperative, through ARTA, plans to increase markets for farm products with agricultural tourism marketing in eastern Kentucky. They will work with Natural Bridge State Park in Kentucky and other regional operations to promote sustainable agriculture by educating area farmers and consumers about:

1.) The value of locally and organically grown food, through events and promotions in cooperation with Natural Bridge State Park whose restaurant serves almost one-million visitors annually;

2.) Building community pride in agriculture and the region's resources through events that promote the beauty and character of the region's land, trees and mountains;

3.) Area agritourism opportunities—including Christmas tree farms, organic produce farms, horse farms for trail rides and other low-impact tourism and agricultural ventures—through educational and promotional materials developed through the project.

Objectives

Increase markets for farm products in eastern Kentucky through agricultural tourism.

Approach

ARTA plans to conduct three major activities during the life of the project. The first activity will be to assist the Natural Bridge State Park Resort to purchase and serve locally and organically grown produce in its restaurant. For the second activity, ARTA will conduct a Fall Harvest Festival each year. The third activity proposed by ARTA will be a "Christmas in the Mountains" partnership program between area lodges and Christmas tree farmers. The program will feature tree sales and weekend activities.

Outreach

ARTA will develop a brochure which emphasizes the natural resources, agricultural bases and community spirit of the region. The brochure will also point out the opportunities for shopping, vacationing and recreating in the area, while supporting local farmers.

ARTA will also work with area radio and newspaper reporters to generate publicity for the project. The Commodity Growers Cooperative will prepare a series of camera-ready articles and photos about the farmers growing produce for the park, the value of locally produced food and the challenges of marketing local produce to local restaurants and vendors. Commodity Growers Cooperative will also distribute information about the project to its regional network of farmers and consumers.

Project duration
2 years

Budget:
SARE $9,580
Matching $9,160

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-48
New Project
December 1997

Evaluation of Mycorrhizal Inoculation on Growth and Quality of Three Eastern North Carolina Christmas Tree Species

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Cooperators
Craig R. McKinley
North Carolina
Cooperative Extension
Service
NCSU

The production of Christmas trees in eastern North Carolina depends on inputs of resources such as fertilizer, pesticides and, in some cases, irrigation water. Frequently, Christmas tree production is only marginally profitable because the costs of these inputs are prohibitively high.

These high costs seriously affect the sustainability of the standard of living of people dependent on Christmas tree income. Most Christmas tree growers in eastern North Carolina are not full-time producers, but use the income to supplement jobs or social security and retirement income. The producer plans to reduce his dependence on off-farm inputs to his Christmas tree operation through the use of mycorrhizal inoculation.

The term mycorrhizae describes a symbiotic relationship between fungi and plants, including trees. The fungus, commonly referred to as mycorrhizae, has been shown to aid pine trees in uptake of water and nutrients, particularly phosphorus. In turn, the fungus receives food from the plant which uses the sun to make sugars—something the fungus can not do. The producer plans to inoculate his trees with mycorrhizae (mycorrhizal inoculation) to lessen the need for fertilizers and other soil amendments.

Objectives

1.) Evaluate early survival, growth and tree quality of mycorrhizal inoculation of seedlings of three eastern North Carolina Christmas tree species.

2.) Establish a demonstration trial to educate Christmas tree growers on benefits of micorrhizal inoculation.

Approach

Ten rows each will be established for Virginia pine, eastern white pine and eastern red cedar. Three hundred seedlings of each species will be used, 100 seedlings for each of three treatments on each species. The three treatments will be:

1.) Mycorrhizae (*Pisolithus tinctorious*) plus Terra-sorb (for moisture retention)

2.) Terra-sorb only

3.) No treatment

Seedlings will be dipped in the appropriate treatment (or none) and planted immediately. Seedling height and stem diameter will be measured at time of planting. Survival, growth and tree quality will be determined at the end of the growing season. Late in the growing season, the presence of mycorrhizal infection and the extent of the infection will be determined.

Outreach

Results will be provided to growers by the NC Cooperative Extension Service through its "Christmas Tree Notes" series. The extension service also proposes to utilize the field planting as a demonstration area for county tours and for Eastern North Carolina Christmas Tree Association field trips.

Project duration
1 year

Budget:
SARE $650
Matching $200

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-49
New Project
December 1997

Crop Production Systems for Nonchemical Control of Reniform Nematodes

Project Coordinator

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Cooperators

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Plant Pathology
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C. Robert Taylor
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Rick Beauchamp
Alabama Coop. Ext. Service

Del Witherspoon
Spoon's Agricultural Service

The reniform nematode is spreading rapidly in Alabama and is becoming an important constraint to cotton production. Monoculture production of cotton is partly to blame for the spread of this pest, and the consequent cost of chemical control is becoming prohibitive for many growers. In addition to the cost, chemical control is not a sustainable solution for many cotton growers.

Objective

Pursue alternative control of reniform nematodes in a sustainable cotton production ecosystem.

Approach

In-field comparisons of various crops in rotation with cotton will be conducted in this project. In particular, the velvet bean, which was a rotational crop grown extensively in Alabama from the late 1800's until the advent of cheap fertilizer and other agriculture chemicals in the 1940s, shows tremendous economic potential for rotation with cotton.

In experimental plots, velvet bean has dramatically reduced populations of bad nematodes, increased populations of good nematodes, and helped control weeds. The velvet bean crop controls weeds partly by rapid growth that smothers weeds and partly, it is believed, through allelopathic properties.

The field will be divided into strips that are 16 rows wide and 250 feet long. The experimental treatments in 1997 will be Suregrow 501 cotton (Bt variety) grown respectively with corn, grain sorghum, velvet bean, velvet bean-corn and velvet bean-sorghum. In 1998 each strip will be planted in the same crop that was planted in 1997. In 1999 all the strips will be planted to Bt cotton. Each fall after cotton harvest, one-half of each strip will be planted to Abruzzi rye and the other half left fallow.

Each year, soil samples for nematode analysis will be collected from each strip at time of planting, mid-season (cotton) and at harvest. Data will also be taken on cotton emergence, plant growth and yield of all crops.

Outreach

A field day will be held in August 1998 in cooperation with the Elmore County Farmers Federation Cotton Committee, the Elmore County Extension office, and Auburn University. Pamphlets and fact sheets will be prepared by the cooperators for distribution at this field day and in subsequent years.

Project duration
3 years

Budget:
SARE $8,892
Matching $14,087

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-50
New Project
December 1997

Effects of Conservation Tillage on Water Quality in Southern Texas

Project Coordinator
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Cooperators

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Weed Scientist
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Weslaco

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TAES
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San Benito

Antolin Gonzales
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Bailey H. Dunlap, Jr.
Southmost SWCD
San Benito

Jimmie R. Childers
Conservation Agronomist
USDA-NRCS
Alice

There is tremendous interest in conservation tillage systems in the Lower Rio Grande Valley in which Cameron County is located. Producers need on-site demonstrations as well as information on the costs and benefits of the systems. The usefulness of tillage alternatives in cotton and grain sorghum have not been previously examined in Cameron County, nor has an economic analysis been performed on a management system that integrates reduced tillage practices with weed and insect management practices.

Objectives

1.) Increase the efficiency of cotton and grain sorghum production.

2.) Reduce production costs through conservation tillage practices that optimize soil moisture reserves and integrate weed and insect management practices.

Approach

The Cameron County Field Crops Committee will conduct the following activities throughout the project.

1.) They will compare the costs and benefits of conventional and pre-plant no-till systems for cotton and grain sorghum production in the subtropical climate of Cameron County, Texas.

2.) Throughout the project they will establish relationships between the effects of pre-plant tillage practices and crop residue management by looking at crop yield, soil moisture, weed control, time, labor costs and net returns.

3.) The effects of tillage systems on cotton growth and on insect and weed management throughout the crop production season will be determined.

4.) The effects of conservation tillage and conventional tillage on soil moisture reserves within the soil with depth will be investigated.

5.) Water quality concerns will be addressed through the application of tillage, nutrient management, and crop management technologies that also will allow acceptable net returns for producers.

Outreach

Field days and/or demonstrations will be used to demonstrate planting into varying amounts and types of residues, split-application of nutrients, weed and insect control, and post-harvest residue management techniques. Workshops will also cover the economics of the above mentioned practices. The producers involved in the project will have the primary leadership roles in the dissemination of this information. Their hands-on knowledge will inform the demonstrations and workshops. Representatives of the cooperating agencies will be available to assist in describing and interpreting the results.

Project duration
3 years

Budget:

SARE	$8,000
Matching	$11,000

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-51
New Project
December 1997

Effect of Different Application Rates of Swine Lagoon Effluent on Corn and Wheat

Project Coordinator
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Cooperators
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Columbus County Soil & Water Conservation District

James Norris
Michael Shaw
North Carolina Cooperative Extension Service

Geoffrey Benson
Ag. & Resource Economics
David Crouse
Soil Science
NCSU

In recent years there has been a great deal of concern over the application of swine lagoon effluent to fields resulting in high concentrations of phosphorus, copper and zinc in the soil. The rates at which swine waste must be applied in order to provide sufficient nitrogen to the crop results in high soil levels of phosphorus, copper and zinc which can have negative effects on soil and water quality. The excess elements have become a problem because the crop can't take up all that is applied during the year, and the excess runs off into rivers and streams or stays in the soil, approaching toxic levels.

The majority of swine producers in North Carolina apply swine lagoon effluent to fields of grass to be used for grazing cattle or producing hay. It is the producer's belief that the nutrients in the effluent can be better utilized to fertilize grain crops grown in rotation.

Objectives

1.) Determine the impact of a reduction in swine lagoon effluent application rates on phosphorus, copper and zinc concentrations in the soil.

2.) Determine the effect of lowered swine lagoon effluent, and nitrogen, applications on the profitability of producing corn and wheat.

Approach

Three five-acre plots 250 feet wide and 875 feet long will be laid out in a field adjacent to the swine operation. One plot will receive swine lagoon effluent at current recommended rates providing sufficient nitrogen for optimal production. The second plot will receive the effluent at a rate that provides adequate phosphorus for optimal production. The third plot will receive no effluent but will receive commercial fertilizers with nitrogen and phosphorus at optimal rates.

Corn, soybeans and wheat will be grown on the plots during the three years of the project. Optimal effluent application rates will be based on the recommended needs of the crop being grown during the application cycle. Soil samples with be taken before and throughout the project to determine the quantity of applied nutrients remaining in the soil after harvest. Tissue samples and yield data will be taken to determine the quantity of nutrients removed from the plots by the three crops. Soil and waste analysis will be conducted by the North Carolina Department of Agriculture. Cost data will be recorded to determine which treatment is most cost effective.

Outreach

At the end of the project a meeting will be held to discuss the results of the project and its applicability to the area and the state. The producer and cooperators plan to conduct presentations dealing with waste management, related alternative systems of waste treatment and utilization, economics, environmental protection and how these topics relate to sustainability.

Project duration
3 years

Budget:
SARE $2,317
Matching $6,699

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-52
New Project
December 1997

Sustainable Pumpkin Production in the Southeast

Project Coordinator
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Cooperators
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Extension Horticulture

David Koon
Joe Potter
Extension Agent

The production of food and fiber with low off-farm inputs is one of the goals of sustainable agriculture. This producer will use a legume cover crop to supply most of the nitrogen demand of his pumpkins. He will also test how the cover crop suppresses weeds, controls erosion and increases soil water holding capacity.

Objectives

1) Evaluate a pumpkin production system using a legume cover crop preceding pumpkins.

2) Use cover crop residue to suppress weeds and to provide erosion control during pumpkin production.

3) Increase soil water holding capacity.

Approach

In the fall the producer will establish four test plots, each consisting of three rows of pumpkins. The following treatments will be replicated in each test plot.

1.) Nitrogen added at 90 lbs/acre
2.) Crimson clover, no N
3.) Crimson clover with 45 lbs/acre N
4.) White dutch clover, no N
5.) White dutch clover with 45 lbs/acre N

The following summer, before the pumpkins are seeded, biomass samples will be taken and the cover crops killed and turned under. Drip irrigation will be used on all test plots. During the growing season plants will be monitored for disease and insect problems.

Leaf tissue samples will be taken at five and eight weeks. Once the pumpkins mature they will be weighed and graded for overall quality.

Outreach

The producer will host field days to demonstrate the use of cover crops as a sustainable alternative to conventional nitrogen inputs and to promote pumpkins as an alternative agricultural enterprise in the Southeast. The field days will be set up to introduce area pumpkin producers to the project results. Additionally, results will be disseminated in the form of extension bulletins and journal articles.

Project duration
2 years

Budget:
SARE $4,655
Matching $3,172

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-53
New Project
December 1997

Cool Season and Warm Season Grasses to Stabilize Erodible Soils and Increase Profitability

Project Coordinator
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Cooperators
W. David Worrell
Wheat Breeder
Texas Agricultural
Experiment Station

Stan Bevers
Ag. Economist
Texas Agricultural
Extension Service

A significant portion of farm income in the southern United States is derived from cattle. Current grazing strategies are primarily single-resource systems in which warm season grasses, wheat, or cool season grasses are utilized exclusively. However, a feature of some southern grazing systems is the utilization of wheat as a dual purpose (grazing/grain) crop.

Changes in the Conservation Reserve Program (CRP) and other price support systems present opportunities to increase the area planted to permanent pastures, to retain pasture lands in established grasses and to integrate these resources with wheat to provide a year-long source of high quality forage. Maintenance of land in warm and cool season species, particularly on highly erodible soils, will preserve soil, aid water quality and promote economic stability.

Objective

Integrate wheat into southern grazing systems to increase profitability and stabilize highly erodible soils.

Approach

Cool season and warm season grasses will be planted in the spring. Cool season grasses will include Hycrest crested wheat grass, Newhy hybrid wheat grass and Fleet bromegrass. The warm season pasture will be planted to BDahl Old World Bluestem. Wheat will be planted as soon after September 15 as soil moisture conditions allow.

Grazing by stocker steers on the wheat pasture will be initiated as soon after planting as possible. Cool season pastures will be grazed by two sets of cattle at different times on the pasture. Cattle will be grazed on warm season grasses in early summer until cool season grasses are ready for grazing in the fall.

Cattle will be weighed each time they are moved on or off a pasture. Pasture forage will be sampled and evaluated for nutrient content and forage quality.

Outreach

The Wichita County Field Crops Committee will sponsor an annual producer/media field day at the study site. Tabulated results will be made available at each field day. In addition, a producer member of the committee hosts a daily television program and will showcase the project at appropriate times during the year. Project involvement by employees of the USDA/NRCS, the Texas Agricultural Experiment Station and the Texas Extension Service will further guarantee information dissemination through field days, producer meetings and popular press articles.

Project duration
2 years

Budget:

SARE	$10,000
Matching	$15,360

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-54
New Project
December 1997

Forest Site Preparation with Swine

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Cooperators
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NC A&T State University

Everett Davis
County Ext. Director
Robeson County

Ed Holland
District Conservationist
NRCS

Nelson Browlee
NC Cooperative Ext.

Steve Muntz
Heifer Project
International

The average cost for establishing a commercial timber stand in the piedmont and coastal areas of the South is $100 per acre. An outdoor swine operation may help to lower these costs and reduce the need for fertilization and chemical removal of undesirable vegetative growth. Swine raised in a forest environment may also benefit from the cooler temperatures provided under a forest canopy. There are over 4000 swine producers (67 percent of total swine operations) in North Carolina with herds less than 100 sows. This project may provide valuable information for a large percentage of North Carolina swine operations.

Objectives

1.) Determine if pigs raised under forest will improve the soil characteristics and fertility of a forested ecosystem.

2.) Determine if pigs raised under forest will improve the long-term economic viability of small swine operations.

Approach

Marketable mature timber will be removed prior to the introduction of pigs. Five plots will be fenced off and the initial stocking rates will be: Plot 1, five sows farrowing twice a year (piglets weaned at thirty days); Plot 2, 30 feeder pigs (20 - 70 pounds); Plot 3, 20 grower pigs (50 - 150 pounds); Plot 4, 10 finishing hogs (150 - 250 pounds); Plot 5, 20 finishing hogs (150 - 250 pounds). An additional acre plot will serve as a control and seedlings will be planted after conventional site preparation in the third year.

Pig numbers will be adjusted according to the results desired and the ability of the ground cover to maintain nutrients from swine waste in test plots. Loblolly pine seedlings will be planted in the test plots after three years.

Outreach

A field day is planned for year three through the Cooperative Extension Program. Results will be published in an extension bulletin and in Heifer Project International's technical newsletter.

Project duration
3 years

Budget:

SARE	$5,088
Matching	$2,675

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-55
New Project
December 1997

Overwintering Survival of Kentucky Honeybees

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Cooperators
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Kentucky State University

Demetrio Zourarakis
KY Division of
Conservation

Mac Stone
KY State University &
Farm Managing Partner

The important role honeybees play in agriculture is known to most fruit and vegetable growers who require bees for pollination. However, the unfavorable economics of beekeeping leads some apiarists in the northern United States and Canada to kill their hives each year instead of trying to overwinter them.

Most beekeepers in Kentucky do not insulate their hives and with an approximately 45 percent loss of bees during the winter months, many Kentucky beekeepers are deciding to leave beekeeping or are being forced to start over with new hives each year. The goal of this project is to develop a sustainable system that allows the hives to survive through the winter.

The producer feels that small actions taken by the apiarist will reduce the current winter kill numbers and improve the overall strength of the colony going into the spring season. In the project he will look at two management practices that can easily be implemented by an apiarist. He will also administer the approved menthol treatment for tracheal mites in a way designed to combat hive losses due to them.

Objectives

1.) Determine if insulating bee hives will increase overwintering survivability.

2.) Utilize a solar apparatus designed to vaporize menthol pellets in the winter.

Approach

The producer will conduct a preliminary study to find the correct placement of the thermal-hygrometer probe used to determine temperature and humidity in the hive. He will also work with the solar unit to determine the most efficient way to vaporize the menthol.

In the final study the producer will work with eight configurations of hives. Four hives will be allocated to each configuration. Different configurations will be used to control for factors other than mites, temperature and humidity. One of the major factors to be dealt with is the rejection of a queen. The producer's goal is to develop a system for overwintering hives and applying menthol with little hive disruption and in an economically viable manner.

Outreach

Annual field days and a workshop in the winter of 2000 will be scheduled for the Kentucky State Beekeepers Association members. The producer will give presentations at the Kentucky Beekeepers Association meetings on the study's findings and results. The producer is also planning to talk to various beekeeping clubs throughout the state.

An article will be written by the project coordinator and cooperators and submitted to the American Bee Journal and Bee Culture magazine.

The project coordinator will develop a fact sheet on the results of the study with the help of his wife who has desktop publishing skills. This fact sheet will be made available to Kentucky beekeepers as well as other beekeepers in similar climates.

Project duration
3 years

Budget:
SARE $5,283
Matching $3,258

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-56
New Project
December 1997

Managed Grazing System to Increase Sustainability

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Cooperators
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Berea College

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Intensive grazing, when properly managed, removes animals from riparian areas, reduces weed competition and provides land areas for wildlife utilization. Although many experts have endorsed this concept, acceptance has been slow in Kentucky. Producers have little experience in the techniques and management required to accomplish it successfully.

This project is dedicated to educating thirty producers on the integration of resources and the benefits of intensive grazing. The Madison County Beef Cattle Association hopes that as the producers begin to utilize parts of the program, other producers will view the results and also begin moving toward managed grazing. Producers in surrounding counties will be encouraged to attend in order to broaden the scope of the project and to provide them the opportunity to develop their own programs.

Objectives

Teach beef producers the purpose, benefits and techniques for developing a managed grazing system and integrated resource management.

Approach

The project will gather together a committee of beef producers, extension, state and local NRCS, Berea College and Eastern Kentucky University personnel. They will develop a day-and-a-half-long hands-on seminar in integrated resource management with a focus on management intensive grazing. The seminar will integrate classroom presentations with hands-on fence building, livestock water development, clipping and weighing forages and forage allocation to grazing animals.

The project will be used to implement a neighbor to neighbor outreach program which utilizes cooperating host farmers who then share their ideas and experiences with other farmers in the community. The host farmer will entertain visiting farmers one-by-one by appointment. Neighbor to neighbor outreach can be used to aggressively market rotational/intensive grazing not only to traditional grazing audiences but also to historically under served groups who will benefit from good land use.

Outreach

The whole project is an outreach project. In addition, fact sheets and brochures will be developed for each participating host farm to be distributed to visiting farmers.

Project duration
1 year

Budget:

SARE	$2,630
Matching	$4,770

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-57
New Project
December 1997

Effect of Limited Environmental Controls on Shiitake Mushroom Production in the Southern Coastal Plain

Project Coordinator
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This producer will utilize oak wood, one of the South's most plentiful and renewable resources, to generate income for small farms. His project will also involve the use of unused poultry houses in the production of high-quality Shiitake mushrooms in the Southern Coastal Plain

During the warmer months in the Southern Coastal Plain, Shiitake mushroom producers, utilizing logs, are able to produce only a small number of poor quality mushrooms-- if they are able to produce at all. The primary difficulty in marketing Shiitake mushrooms in the summertime is the variability in quality. Buyers need a consistent source of good quality product in quantities they can depend on.

In colder regions of the country, heating a wide-range of strains for winter production is quite common. In areas where the temperature will stay below freezing for months at a time, productive logs are warmed indoors for approximately two weeks and then shocked with cold and irrigation. Afterward, a temperature range of 55 to 65 degrees Fahrenheit is maintained until the time of harvest. The producer will adapt this method to southern growing conditions in the winter.

Objectives

1.) Determine the feasibility of limited environmental controls on Shiitake mushrooms grown on logs in the Southern Coastal Plain.

2.) Develop an energy- and labor-efficient method that would allow log producers to produce high-quality mushrooms during times of environmental stress.

3.) Evaluate a production method utilizing an abandoned shed and an old Thermo-King refrigeration unit from a semi-trailer.

Approach

Three groups of 500 oak logs five feet long and five to seven inches in diameter will be purchased and inoculated. The inoculated logs will be placed in a wooded area where irrigation is available. The logs will remain there for six to eight months and be watered as needed.

As fruit begin to appear, two of the three groups will be moved to special housing for the remainder of the experiment. One of the two moved groups will be housed in a portion of an abandoned poultry house. The structure will keep unwanted precipitation off the logs and allow for complete control of log moisture. The second of the two moved groups will be placed in a 24 foot by 60 foot shed with insulated roof and curtained sides. Climate will be controlled in this group through the use of cooling and heating. The logs will be heated to 75 degrees for a period of 3 to 4 days, cold-shocked for 12 hours and then maintained at 55-65 degrees for the fruiting period.

Outreach

After the production systems have been established, two field days will be conducted through the Florida Extension Service. Those specifically invited will be members of the Florida Shiitake Mushroom Growers Association (some of whom are current or former contract broiler producers.)

Two fact sheets will be produced for distribution by the Florida Extension Service. One fact sheet will cover the conversion of a structure to a partially environmentally-controlled production system. The other fact sheet will focus on the results of the experiment.

At least one article will be prepared for popular press. In the year 2000, Charles McRae will give a presentation of the results of this research project at a Shiitake mushroom grower's conference.

Cooperators

David Zimet
Univ. of Fla. Institute for Food and Agricultural Sciences (IFAS)

Project duration
3 years

Budget:
SARE $9,990
Matching $16,621

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-58
New Project
December 1997

Evaluation of an Alternative Low-input Production System for Fresh Market Tomato

Project Coordinator

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Cooperators

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University of Georgia

Dan Chellemi
USDA

Steve Olson
Jimmy Rich
Fred Rhoads
Pete Anderson
University of Florida

The producers will determine the feasibility and economic viability of an alternative production system for fresh market tomatoes. The standard production system utilized in the southeastern United States is designed to achieve profitability by maximizing yields. Raised, fumigated beds are covered by plastic mulch and the crop is managed through the extensive use of inputs. This system is becoming problematic, particularly for limited-resource farmers, due to limited availability of suitable land, high preharvest production costs, problems with the disposal of plastic mulch, and the loss of methyl bromide as a soil fumigant.

The project is designed to minimize the impact of soilborne pests, reduce agricultural inputs, optimize profitability and increase participation by limited-resource farmers. These goals will be accomplished by combining minimum tillage practices with existing bahaia grass pasture. This approach will permit the production of fresh market tomatoes on land which has been established for grazing, hay or sod production, without permanently destroying the integrity of the pasture. Access to pasture will foster implementation of sound crop rotation programs which will eliminate the need for broad spectrum fumigants including methyl bromide. This production system utilizes pasture as a natural mulch eliminating the disposal problems associated with the use of plastic mulch. Minimum tillage practices reduce soil erosion, increase soil tilth and conserve organic matter.

Objectives

Produce tomatoes in a bahaia grass pasture which serves as a living mulch and creates an environment hostile to tomato root nematodes.

Approach

Large (3-4 acre) plots will be established for the conventional and alternative production systems. The plots will be located adjacent to each other. The same tomato cultivar will be grown in both plots permitting comparison of marketable yield and fruit quality. Large separate plots will allow for an accurate assessment of labor inputs, material inputs, and packout data. Reports on the incidence of foliar pests will be obtained bi-weekly by a private scouting firm. These reports will be used to decide if and when pesticide applications will be made. The cooperators will scout for foliar and soilborne pests at various intervals throughout the crop and for root-galling and nematode populations at harvest and will provide a record of incidence and severity. The cooperators will also assist in the analysis, interpretation, and presentation of data obtained in this project. A careful accounting of clean-up costs will be made including the costs of disposal if the plastic film.

Marketable yield will be measured after fruit has been graded according to USDA standards. Labor costs will be documented by both graded man-hours and hourly wages as wages will differ depending on the level of skill required. Material input costs will be documented using purchasereceipts.

Outreach

Project information will be shared by hosting a field day for area tomato growers. The cooperators will produce an extension fact sheet and present project results at regional grower meetings and scientific conferences.

Project duration

1 year

Budget:

SARE	$5,109
Matching	$5,734

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-60
New Project
December 1997

Economics of Extended-season Cut Flower Production

Project Coordinator
Vicki Stamback
1123 North Manning
Stillwater, OK 74075

Ph: (405) 624-9459

Cooperators
John Dole
Horticulture
Oklahoma State University

Pam & Frank Arnosky
Texas Specially Cut Flowers

Specialty cut flowers have proven to be a viable alternative agricultural business in the central United States and specialty cut flower production works very well with sustainable agriculture practices. Cover crops, biological pest control. erosion control and addition of organic matter to the soil result in excellent crops at reduced production costs.

In central Oklahoma, the majority of specialty cut flower operations utilize field production with a growing season from May through September. However, the strongest selling season runs from October through May which includes the major holidays. Demand for cut flowers and foliage is particularly strong in November for Thanksgiving Day sales, February for Valentine's Day sales, and April/May for Easter and Mother's Day sales. If a cut flower operation is able to extend their season and produce during fall, winter, and spring, the year-round cash flow generated would mean greater success.

The production season can sustainably be extended during winter months by using minimally heated cold-frames reducing the use of natural resources for production. By producing in the ground in cold-frames rather than in traditional greenhouses, the producer plans to use less water, no liquid fertilizers (no nitrate and phosphate runoff) and no pesticides. An elimination or dramatic reduction in these items will provide a more sustainable operation at lower production costs. This results in a crop which costs less to produce with higher profits for the producer. Extended season production would also increase sales by allowing producers to grow crops which normally cannot be grown during the regular growing season because of heat, weather or pests.

Objectives

1.) Provide inexpensive season-extension production of specialty cut flowers from October to May without excessive use of fossil fuels.

2.) Increase the selection of cut flowers that can be offered by producers.

Approach

The cost of the green houses is being carried by the producer. She will grow cool season and warm season annuals in three greenhouse environments: heated (60-65 degrees F night); minimally heated (35 degrees F night) and unheated (ambient). One outdoor treatment will also be tried.

The following species will be propagated from seed.

1.) Cool season annuals (all environments)

Pansy—Oregon Giants
Larkspur—Giant Imperial mix
Stock—Cheerful White
Snapdragon—Animation mix
Delphinium—Casa Blanca

2.) Warm season annuals (heated and minimally heated environments only)

Lupine—Sunrise Bluebonnet
Celosia—Chief mix
Anemone—Jerusalem mix

The producer will collect the following data at harvest; harvest date, stem length, stem number, number of plants and flower quality per replication. At the end of the experiment energy expenses will be calculated and labor cost determined. High and low air and soil temperatures will be taken on a daily basis throughout the length of the project.

Outreach

The producer and cooperators will write and print two fact sheets for general distribution. The fact sheets will address marketing and cost analysis methods for flower production. The cost analysis fact sheet will consist of very simple and clear methods of determining true profits

A workshop will be conducted by the producer and the cooperators. The workshop will be held in cooperation with the southern region of the Association of Specialty Cut Flower Growers (ASCFG). This workshop will have both oral presentations and the written fact sheet as backup information for the participants. The producer will also present results at the ASCFG National Conference and Trade Show Raleigh.

Project duration
1 year

Budget:
SARE $8,100
Matching $15,100

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-61
New Project
December 1997

Algae-based Winter Feed for Small-scale Goat Farm Operation

Project Coordinator
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2139 Oak Hill Rd.
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Ph: (770) 784-9707

Cooperators
Mercedes Mondecar
Gerald Grams
Clark Atlanta University

Joe West
Coastal Plains Exp. Station

Calvin Alford
UGA, Athens

Meat goat farming is rapidly becoming a growth industry in Georgia especially for small farmers. The difficulty in any successful meat goat operation is the ability to sustain a breeding herd throughout the (albeit short) winter in a cost effective manner.

What the producer feels is needed is an alternative/supplemental source of feed that is able to at least partially sustain a pregnant or lactating animal through the winter when no browse is available. The feed source should provide good nutrition, be cheap to produce and require no chemical fertilizers or other chemical additives.

Objectives

Examine the suitability of farm-produced algal mats as a feed source of a goat herd throughout the winter.

Approach

Algae including the common blue green algae (cyanobacteria) are aquatic plants which have no roots, leaves, seeds, or flowers. Over half of all the photosynthesis on earth is carried out by algae and they produce oxygen as a by-product. Blue-green algae are known by several other names including "pond scum" and "slime". The algae can be encouraged to grow on a medium that is in ready abundance on any farm regardless of size. That medium is silage made from grass clippings. This combination of grass clipping silage and algae is referred to as algal mat. The most notable feature of these mats is that on a pound-for-pound basis they have higher percentages of protein, chlorophyll and Vitamin B complex than do regular agriculture plants.

Analysis of a mature mat (which is harvested after 7-15 days of growth) has shown the mat contains 26% protein and 43% carbohydrate. The biomass production is 15 g/square meter /day which compares favorably with alfalfa. Algal mat requires only a pond (artificial is acceptable), grass clipping silage and sunlight and can be produced year round. The greatest benefit of the algal mat is that these highly nutritious organically grown mats can be produced on land that has zero agricultural value at essentially no cost.

The producer will construct two artificial ponds (2 meters by 20 meters each) out of wood and lined with heavy gauge plastic in an area that receives full sun. A third pond will be constructed on a farm in south Georgia to test the reproducibility of the results. Drying racks will be constructed out of wood and plastic screen.

Silage will be prepared by tightly packing fresh-cut grass clippings in large mason jars which will be tightly capped and left for 14 days. The silage will then be added to six inches of well water in the pond. Blue-green algae starter will then be added.

A clear plastic sheet will be placed over the ponds to prevent insect infestation and to promote algal growth. The algal mat should be ready in 15 days and will be removed from the surface of the pond with a rake. It will then be laid on the screen to dry. The dried mat will be weighed and stored in paper sacks in a dry location in the barn.

A 50 percent algal mat/50 percent feed mixture will be fed to 10 goats while 10 others will be fed a normal diet as a control. Both groups will be fed a predetermined amount of dry grass hay. The mat will be analyzed for nutrients and digestibility by University of Georgia researchers. Goat weight gains and milk production will also be measured. Costs of producing and using algal mat will be determined for this project.

Outreach

The entire process will be documented with a camera in preparation for presentation at the Georgia Organic Growers annual symposium. A seminar will also be proposed to the Georgia Meat Goat Association for inclusion in their symposium. A detailed paper will be written outlining the process of producing the algal mat and its use as a goat feed supplement. A short article will be submitted to *Goat World* magazine.

Project duration

2 years

Budget:

SARE	$7,907
Matching	$2,330

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-62
New Project
December 1997

Maximizing Corn Production Through Tillage, Cultivar Selection and Fertilization in the Mountains of Southeast Kentucky

Project Coordinator
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Henderson Settlement
P.O. Box 205
Frakes, KY 40940

Ph: (606) 337-3613

Cooperators
Morris Bitzer
Coop. Ext. Serv.
Agronomy
Univ. of KY.

David Ditsch
Coop. Ext.
Serv.
Quicksand Exp. Station
Univ. of KY.

Mr. Phil Smith
Coop. Ext.
Serv., Univ. of KY.
Whitley County Agent

Virginia Shor
USDA
Farm Services Agency

Rodney Henderickson
USDA
Natural Resources
Conservation Service

No-till practices for soil conservation and split application of fertilizers are no longer new techniques. Nevertheless, it is estimated that only 30 percent of corn producers in southeast Kentucky are implementing them. It is also estimated that as many as 90 percent of producers in the remote areas this project will serve do not consult cooperative extension agents about fertilization practices and information on highest yielding cultivars for the area.

This producer organization project will involve producers who do not often consult with extension about the best practices for corn production. By working directly with producers, particularly marginal ones, the project will help them produce greater yields, preserve topsoil, increase efficiency and profits and be encouraged to continue with agriculture as a means of income for the area.

Objectives

1.) Improve environmental quality by encouraging the use of no-till planting to reduce soil erosion on highly erodible land.

2.) Encourage economic sustainability by improving production on limited mountain region acreage by utilizing:

a) the cultivar of corn best suited for production and storage in the area;

b) soil testing for appropriate fertilization and liming;

c) techniques for split application of nitrogen.

Approach

Corn producers in two Kentucky and two adjacent Tennessee counties who can benefit from, and want to participate in, the project will be identified. They will be receive assistance in soil sample collecting and attend three to four field days at the Henderson Settlement demonstration farm. They will see demonstrations of planting techniques, split application of nitrogen and the resultant mid-season growth. A field day will be devoted to harvest of different varieties tested at the demonstration farm as well as the economics of conventional versus no-till methods. At least three on-site visits to each participant's farm will be made over the three-year period.

Outreach

Seven field days will be held over the two-year demonstration period. In addition, contact will be maintained with the participants during the three-year project period. Harvest results (yield, picking ease, and kernel loss) will be mailed out following harvest for each demonstration year.

Project duration

3 years

Budget:

SARE	$4,955
Matching	$7,456

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-63
New Project
December 1997

Sustainable Wheat Management Systems

Project Coordinator

Curtis Torrance
Rt. 3, Box 5
Gage, OK 74843

Ph: (405) 923-7850

Cooperators

Gene Krenzer
Jim Stiegler
Agronomy
OSU

Roger Gribble
Northwest Area
Agronomist

R.A. Devore
Extension Ag. Agent

J.C. Hobbs
Northwest Area Ag.
Economist

Della Terry
Conservation District

James Shaffer
NRCS

Usually, either wheat-fallow-wheat or wheat-fallow-sorghum-fallow-wheat (two crops in three years) systems are used in dry land production in the Oklahoma panhandle while continuous cropping systems are used in central Oklahoma. Gage, where the project is situated, is located in Ellis county and is central to these two areas. Consequently, the producer wants to evaluate the economic impact of annual cropping compared with fallow systems.

Objectives

1.) Determine if wheat grain yield is lower in continuous wheat monoculture than in rotation.

2.) Determine whether the tillage system (no-tillage vs minimum or clean tillage) influences grain yields in continuous monoculture and rotation.

3.) Evaluate the amount of nitrogen (if any) a cover crop of Austrian winter peas contributes to subsequent wheat production.

Approach

The project consists of two experimental areas--one will be no-till and the other conventional till--within which eight wheat crop rotation systems (treatments) will be replicated four times in each area. Each treatment will be planted in plots that will be 30 feet wide by 60 feet long. The eight treatments are as follow:

System	Year 1	Year 2	Year 3
1	Wheat	Wheat	Wheat
2	Fallow	Wheat	Fallow
3	Wheat	Fallow	Wheat
4	Peas	Wheat	Peas
5	Wheat	Peas	Wheat
6	Fallow	Sorghum	Wheat
7	Wheat	Fallow	Sorghum
8	Sorghum	Wheat	Fallow

Wheat and peas will be planted with a ten-foot grain drill at 60 pounds per acre for wheat and 20 pounds per acre for peas. Sorghum will be planted with a fifteen-foot planter at 1.25 pounds per acre. Austrian peas will be killed in the early flowering stage before seed set. The residue will be incorporated in the conventional till area and left on the surface in the no-till area.

Outreach

Timely articles will be included in both the local extension and conservation district newsletters. The county extension agent, through local radio programs, will update producers of progress onthe studies. Radio programs will include occasional interviews with Curtis Torrance and project cooperators. Results will be summarized and be shared throughout the northwest district for agent training and producer meetings.

A field day will be held each year to show the trials to producers. A fact sheet will be prepared to summarize the whole project at completion.

Project duration
3 years

Budget:
SARE $9,344
Matching $5,070

SARE
Sustainable Agriculture Research and Education
Southern Region

FS97-64
New Project
December 1997

Evaluation of a Low-cost, Innovative Ensiling System for Small to Medium Dairy Operations

Project Coordinator
David and Leianne Wright
Canebrake Farms
174 Cane Creek Farm Rd.
Alexandria, AL 36250

Ph: (205) 820-3729

Cooperators

Henry Dorough
Ala. Cooperative Ext.

Don Ball
Agronomy
B.R. (Pete) Moss
Animal & Dairy Science
Mr. George Young
Ag. Economics
Auburn University

An increasing number of dairies are utilizing pasture as a major source of food to sustain profitable operations. However, few geographic areas can sustain pasture for the entire year. If high quality excess forage growth in pastures could be harvested and stored efficiently and economically, it would help meet nutritional needs during periods of limited forage. Harvesting excess pasture as hay is a common solution but can create problems because pasture forage growth is often available during periods when rain causes severe difficulty with hay curing.

Ensiling various crops, including those used for pasture, has been a viable on-farm alternative to meet forage needs for some time. Silage harvesting is not greatly affected by weather so ensiling excess pasture is a sustainable solution. However, silage is not practical on many farms because of the expense of storage and equipment requirements, effluent losses (a waste of nutrients and an environmental hazard), and the difficulty of blending silages to meet livestock nutritional needs.

The producer intends to address the above difficulties with a vacuum ensiling system. The system will allow limited equipment and structure requirements and the ability to ensile small amounts of forage to be harvested at any one time. This is especially important for a small dairy producer struggling to match silo capacity with herd size in order to minimize silage spoilage at feed out time.

Objective

1.) Evaluate a low cost alternative ensiling system.

2.) Determine if a low cost alternative ensiling system will enhance profitability and sustainability of dairy operation.

Approach

Forage crops will be ensiled annually for two years. The planned forages will be ryegrass, alfalfa, bermuda grass and pearl millet because they are used on the producer's farm and they represent a winter annual, a cool season perennial, a warm season perennial and a summer annual respectively. The forage will be piled on plastic and sealed by rolling the edges together around PVC pipe. The rolled plastic will be held together by a C clip made from a piece of PVC pipe the same diameter as the pipe on which the plastic was rolled.

A vacuum will be pulled on the plastic wrapped forage using an old milk vacuum pump. Through preliminary trials the producer found that the ensiling process was satisfactory, the cows consumed the silage with no problems and milk production was maintained. The producer will determine how often to pull a vacuum, silage temperature, nutrient analysis and milk production and quality.

Outreach

Two field days will be held with presentations from all cooperators of the project.

The producer will speak at the North American Grazing Conference. The project cooperators will present the results to a county extension in-service training session and other local, state and professional meetings involving producers and professionals.

The cooperators will publish information about the project in two newsletters, two extension publications and write a professional journal article. A video tape will also be made available at a nominal cost to producers.

Project duration

3 years

Budget:

SARE	$10,000
Matching	$10,800

Administrative Council

1997 Membership

Adell Brown
Southern University
Louisiana

Oscar P. Butler
South Carolina State University
South Carolina

Steve Carmichael
EPA
Georgia

D.C. Coston
Agricultural Experiment Station
Oklahoma State University
Stillwater, OK

David Foster
Cooperative Extension
Arkansas

Phil Greeson
US Geological Services
Georgia

Alex Hitt
Producer
North Carolina

James Horne
Kerr Center for
Sustainable Agriculture
Oklahoma

Larry Jeffries
Producer
Kentucky

William Lee
Producer
Alabama

Bryce Malone
Dept. of Agriculture & Forestry
Louisiana

Lorna McMahon
Producer
Tennessee

Steven Muntz
Heifer Project Intl.
Kentucky

Rob Myers
SARE Program Director
USDA/CSREES
Washington, DC

Marriette H. Newcomb
Producer
Virginia

Charles A. Onstad
USDA/ARS
Texas

Jerry Pennick
Federation of Southern
Cooperatives
Georgia

La Rhea Pepper
Texas Organic Cotton Producers
Texas

Tom Trantham
Producer
South Carolina

Gene Turpin
Producer
Kentucky

Donald Voth
Univ. of Arkansas
Arkansas

Harry Wells
Pollution Prevention Office
USEPA
Washington, DC

Duties

The Southern Region SARE Administrative Council is responsible to the Secretary of Agriculture through the CSREES-ES partnership. Specific responsibilities are to:

* Appoint a regional host institution and regional coordinator subject to the approval of the USDA;
* Make recommendations to the USDA concerning research and education projects that merit funding;
* Promote sustainable agriculture research and education programs in the Southern Region;
* Establish goals and criteria for the selection of projects within the Southern Region;
* Appoint a Technical Advisory Committee for evaluation of proposals for projects to be considered for funding
* Review and act upon the recommendations of the Technical Advisory Committee and coordinate its activities with the host institution;
* Prepare and make available an annual report concerning Southern Region activities in sustainable agriculture.

Membership

Terms of membership are for three years, with approximately one-third rotating off each year. The membership of the Administrative Council includes:

* Farmers/ranchers practicing sustainable agriculture, including farmers/ranchers representing Best Utilization of Biological Applications and representing Integrated Management Systems;

* Nonprofit organizations with demonstrable expertise in sustainable agriculture including organizations representing Best Utilization of Biological Applications and organizations representing Integrated Management Systems;

* Agribusiness with demonstrable expertise in sustainable agriculture

* Representatives from the following:
  - USDA Agriculture Research Service
  - USDA Cooperative State Research Education and Extension Service
  - US Environmental Protection Agency
  - Natural Resource Conservation Service
  - State agency representing sustainable agriculture
  - State agricultural experiment stations
  - State Cooperative Extension Services
  - US Geological Survey

* Other persons knowledgeable about sustainable agriculture and its impact on the environment and rural communities.

Technical Advisory Committee

Duties

The primary goal of the committee is to provide guidance to the Southern Region SARE program concerning the technical merit of proposals and projects. The committee provides recommendations for funding based on technical merit through the Project Review Committee to the Administrative Council.

* Evaluate preproposals and full proposals submitted to the SARE program.

* Participate in project and program reviews.

* Work with the Project Review Commmittee and Host Institution on developing appropriate proposal and project evaluation guidelines.

Membership

Terms of membership are for three years, with approximately one-third of the members rotating off the committee each year.

Members are appointed by the Adminstrative Council from the following sectors:

* Farmers/ranchers who practice sustainable agriculture, including farmers/ranchers representing Best Utilization of Biological Applications and representing Integrated Management Systems;

* Nonprofit organizations with demonstrable expertise in sustainable agriculture including organizations representing Best Utilization of Biological Applications and organizations representing Integrated Management Systems;

* Agribusiness with demonstrable expertise in sustainable agriculture

* Representatives from the following:
  - USDA Agriculture Research Service
  - USDA Cooperative State Research Education and Extension Service
  - US Environmental Protection Agency
  - Natural Resource Conservation Service
  - State agency representing sustainable agriculture
  - State agricultural experiment stations
  - State Cooperative Extension Services
  - US Geological Survey

* Other persons knowledgeable about sustainable agriculture and its impact on the environment and rural communities.

1997 Membership

Viviana Carro
University of Puerto Rico

Mary Clouse
RAFI
North Carolina

Gerit Cuperis
Oklahoma State University

Ted Feitshans
North Carolina State Univ.

Bryan Hubbell
University of Georgia

Clarence Johnson
Fort Valley State University
Georgia

Mark Keating
Northamton County Center
North Carolina

Rose Koenig
Producer
Florida

Luanne Lohr
University of Georgia

Ray McKinnie
North Carolina A&T
University

John Morrison
National Contract Poultry
Growers Association
Louisiana

Jeanna Myers
Partners in Agriculture
North Carolina

James Novak
Auburn University
Alabama

Kome Onokpise
Florida A&M University

Lorette Picciano
Rural Coalition
Washing ton , DC

David Redhage
Kerr Center for
Sustainable Agriculture
Poteau, OK

Errol Rhoden
Tuskegee University
Alabama

Craig Rothrock
University of Arkansas

Christine Rugen
ATTRA
Arkansas

Jennifer Schumacher
Heifr Project International
Arkansas

Robert Zabawa
Tuskegee University
Alabama

Active SARE Projects

Project #	Project Title	Lead Institution	Project Coordinator	SARE Funds	Matching Funds
LS93-52	Utilization of Dairy Manure in Low-Input, Conservation Tillage Animal Feed Production Systems	University of Tennessee	Michael Mullen	$ 90,635	$ 36,123
LS93-53	Sustainable Whole Farm Grain/Silage Production Systems for the Southeast	Auburn University	Wayne Reeves	$ 240,639	$ 218,600
LS93-54	Evaluation of Low-Input, No-Till, No-Herbicide Continuous Grazing System for Grazing Cows	Clemson University	Jean Bertrand	$ 118,911	$ 62,700
LS93-55	Cover Crop Integration into Conservation Production Systems for Cotton and Sorghum	USDA/ARS	Seth Dabney	$ 135,540	$ 117,040
LS94-57	Disease and Insect Management Using New Crop Rotations for Sustainable Production of Row Crops	University of Georgia	Barry Cunfer	$ 152,200	$ 52,614
LS94-58	Post-CRP Land Management and Sustainable Production Alternatives for Highly Erodible Lands in the Southern Great Plains	USDA/ARS	Thanh Dao	$ 196,100	$ 90,000
LS94-59	Assessing the Impact of Beneficial Insects on Organic Farms (Also AS94-13)	North Carolina State University	George Kennedy	$ 17,735	$14,068
LS95-60.1	Integration of Animal Waste, Winter Cover Crops, and Biological Antagonists for Sustained Management of Columbia Lance and Other Nematodes on Cotton	North Carolina State University	Kenneth Barker	$ 46,721 $ 96,691	$ 12,356 $ 24,593
LS94-61	Integrating Sustainable Forestry into Whole Farm Management of Minority and Limited-Resource Landowners in Three Regions of Arkansas	Winrock International	Erin Hughes	$ 246,710	$ 159,086
LS94-62	Intercropping Small Grains and Lupin for Sustainable On-Farm Utilization	Auburn University	Edzard van Santen	$ 143,151	$ 164,759
LS94-63	Regional Center for Sustainable Dairy Farming	North Carolina State University	Steve Washburn	$ 180,497	$ 127,924
LS95-65	Wildlife Enhancement	North Carolina State University	Peter Bromley	$ 98,205	See AS95-18
LS95-67	The Development of Pasture-Based Swine Production Systems for Limited Resource Farms in the Mississippi Delta	Arkansas Land and Development Corporation	Bryant Stevens	$ 274,412	$ 68,852
LS95-68	Using Farm Family Case Studies to Teach Sustainable Agriculture	University of Tennessee	Tim Cross	$ 146,630	$ 137,090

Active SARE Projects

Project #	Project Title	Lead Institution	Project Coordinator	SARE Funds	Matching Funds
LS95-69	Managing Soil Phosphorous Accumulation From Poultry Litter Application Through Vegetable/Legume Rotations	Texas A&M	D.R. Earhart	$ 135,000	$ 90,813
LS95-70	Effects of Organic and Chemical Fertility Inputs on Soil Quality In Limited Resource Vegetable Farms	Virginia Tech	Greg Evanylo	$ 184,319	$ 79,351
LS95-71	Developing Municipal/On-Farm Linkages for On-Farm Composting and Utilization of Yard Wastes	Virginia Tech	Greg Evanylo	$ 69,167	$ 24,522
LS95-72	Agronomic and Economic Benefits of Intercropping Bean with Banana	University of Puerto Rico	Lii-chyuan Liu	$ 98,845	$ 50,239
LS96-73	Soil Conservation and Pest Management Impacts of Grass Hedges	USDA-ARS	S. Dabney	$ 137,352	$ 79,500
LS96-74	Improving Integrated Resource Management Skills of Beef Producers	Oklahoma State University	D. Doye	$ 163,642	$ 330,313
LS96-75	Developing Sustainable Crop Management Systems for Improving Production of Culinary Herbs in the Virgin Islands	University of the Virgin Islands	M. Palada	$ 143,529	$ 64,420
LS96-76	Integration of Pastured Poultry Production Into the Farming Systems of Limited Resource Farmers	Heifer Project International	S. Polson	$ 149,624	$ 141,500
LS96-77	Development of Sustainable Cropping Systems for Seedless Watermelon and Fall Lettuce in Rotation with Green Manures	North Carolina A&T State University	M.R. Reddy	$ 182,751	$ 94,129
LS96-78	Saving the Southern Legacy:Heirloom Plants and Local Knowledge for Profitable, Sustainable Agriculture.	University of Georgia	R.E. Rhoades	$ 152,817	$ 100,748
LS96-79	Multi-Cropping Cattle and Watermelon in the Southern Plains.	Oklahoma State University	W. Roberts	$ 54,752	$ 49,600
LS96-80	Implementation of Alternative Agriculture Strategies for Rural Community Sustainable Development Northampton County, Virginia	The Nature Conservancy	T. Thompson	$ 228,517	$ 101,098
LS97-82	Sustainable Crop and Livestock Systems in the Texas High Plains	Texas Tech University	Vivien Allen	$ 222,125	$ 211,483
LS97-83	The Hometown Creamery Revival	Dairy Farm Cooperators	Vicki Dunaway	$ 145, 474	$ 46,585

Active SARE Projects

Project #	Project Title	Lead Institution	Project Coordinator	SARE Funds	Matching Funds
LS97-84	Regionally Centered Sustainable Agriculture System	Clinch Powell Sustainable Development Initiative	Anthony Flaccavento	$ 173,240	$ 235,635
LS97-85	Impacts on Agricultural System Sustainability from Structural Change in Peanut, Poultry, Swine and Tobacco Production Systems	Center for Sustainable Systems	Hal Hamilton	$ 174,858	$ 70,000
LS97-86	Equal Access to Agricultural Programs and Opportunities	Land Loss Prevention Project	David Harris	$ 151,290	$ 379,494
LS97-87	An Integrated Vegetable Production, Postharvest and Marketing System for Limited-Resource Farmers in South Georgia	University of Georgia	Freddie Payton	$ 134,800	$ 136,642
LS97-88	Producers Assessment of Sustainable Land Management Practices to Project Water Quality	USDA-ARS Southern Piedmont Conservation Research Center	Jean Steiner	$ 198,864 $ 30,000 (ACE)	$ 149,975
LS97-89	Integration of Freshwater Prawn Nursery and Growout System Into Diversified Farm Systems	Kentucky State University	James Tidwell	$ 155,197	$ 162,728

Active ACE Projects

Project #	Project Title	Lead Institution	Project Coordinator	ACE Funds	Matching Funds
AS93-8	Development of Sustainable Area-Wide Weed Management Practices for Improved Land Utilization (Continued as LS94-64)	University of Tennessee	Jerome Grant	$ 161,240 $ 3,760 (SARE)	$ 133,000
AS93-9	Using Soldier Flies as a Manure Management Tool for Volume Reduction, House Fly Control and Feedstuff Production	University of Georgia	Craig Sheppard	$ 49,100 $ 2,150 (SARE)	$ 12,300
AS94-11.1	Use of Poultry Litter or Manure for Root-knot Nematode Management on Vegetables and Field Crops	Clemson University	Bruce Fortnum	$ 99,900 $ 46,792	$ 81,000 $ 54,000
AS94-13	Assessing the Impact of Beneficial Insect Populations on Organic Farms (Also LS94-59)	North Carolina State University	George Kennedy	$ 37,207	$ 14,068
AS94-14	Forage, Biomass and Biogas Integrated Systems for Animal Waste Management	Texas Ag. Exp. Station	M. J. McFarland	$ 101,180	$ 157,894
AS94-16	Development of Guidelines for and Demonstration of Efficient Treatment of Swine Lagoon Wastewater by Constructed Wetlands	Auburn University	Tom A. McCaskey	$ 130,325	$ 78,553
AS95-18	Wildlife Enhancement and Education as Catalyst in the Widespread Implementation of Sustainable Ag Practices (Also LS 95-65)	North Carolina State University	Peter Bromley	$ 75,000	$202,904
AS95-19	Development of Biological Control Methods for Citrus Rust Mites and Spider Mites on Florida Citrus Utilizing Predaceous Arthropods (Also LS95-66)	University of Florida	Carl Childers	$ 75,000	$ 35,000
AS95-21	Reduced Risk Cockroach Control in Confined Animal Production	North Carolina State University	Coby Schal	$ 38,840	$ 15,889
AS95-24	Identifying Pesticides Most Compatible With Parasites of the Citrus Leafminer	University of Florida	Marjorie Hoy	$ 33,125	$ 24,487
AS96-25	Controlling Cheat and Annual Ryegrass in Small Grains Using Novel Crop Harvesting Technologies	Oklahoma State University	T.F. Peeper	$ 125,000 $ 83,624 (SARE)	$ 248,935

Active Producer Projects

Project #	Project Title	State	Project Coordinator	SARE Funds	Matching Funds
PG94-5	Vegetable Marketing Strategies for a Small Farm Co-op	South Carolina	Sea Islands Farmers Co-op	$10,000	$1,850
PG95-20	No-Till Vegetable Demonstration	Virginia	Linford Belcher	$8,300	$17,200
PG95-21	Pecan IPM Using Black-Eyed Peas as a Trap Crop	Texas	Kyle Brooksheir	$4,000	$4,098
PG95-22	No-Till Grain Production for Soil and Moisture Conservation	Oklahoma	Bob Dietrick	$9,818	$19,636
PG95-23	No-Till Cotton Production Using Best Management Practices	Mississippi	Charles Donald	$8,295	$53,280
PG95-24	Alternative Control of Soil Diseases in Vegetable Production	Virginia	Dennis Dove	$5,625	$4,060
PG95-25	Development of Potting Soil Mixes from Local Wastes	Florida	Steve Garrison	$9,600	$13,800
PG95-26	Testing the Efficacy of Alternative Methods of Whitefly Control in Organic Vegetable Production	Florida	Rosalie Koenig	$5,200	$1,875
PG95-27	High-Value, Small-Scale Sustainable Vegetable and Fruit Production Methods	North Carolina	Larry & Judy McPherson	$9,612	$4,942
PG95-28	Improving Tropical Soils by Utilizing Organic Wastes	Puerto Rico	Andre Sanfiorenzo	$10,000	$20,400
PG95-30	Management of Artificial and Restored Wetlands to Improve Water Quality	Florida	A. Glenn Simpson	$10,000	$45,200
PG95-31	Improving Quality of Slaughter Hogs as a Marketing Strategy for Small Producers	Kentucky	Bluegrass Pork Producers	$9,150	$17,300
PG95-32	Native Pecan Orchard Management Using Best Management Practices	Arkansas	Bill Wilson	$ 5,986	$ 13,700
PG95-33	Cover Crops in Integrated Vegetable Production Systems	South Carolina	Charles Wingard	$ 9,285	$ 11,315
PG95-34	Hydroponic Vegetable Production in Conjunction with a Trout Farming Operation	North Carolina	Carl Zeitlow	$ 9,975	$ 6,425
PG96-35	Aquaculture Conversion Model for Poultry and Hog Facilities Emphasizing Building Re-use and Recycled On-Farm Resources	North Carolina	Benny Bunting	$ 6,000	$ 74,064
PG96-36	Native Warm Season Grasses as Hay Source for a Family Operated Goat Dairy	Texas	Lee B. Dexter	$ 9,640	$ 13,169

Active Producer Projects

Project #	Project Title	State	Project Coordinator	SARE Funds	Matching Funds
PG96-37	Identification of Cover Crops to Enhance the Habitat of Specific Beneficial Insects in Sustainable Production Systems	North Carolina	Kenny Haines	$ 8,452	$ 5,750
PG96-38	Multiple On-Farm Use of Aquatic Plants and Animals	North Carolina	Harvey Harman	$ 9,575	$ 12,100
PG96-39	Group Strategic Alliances for Carroll County Feeder Calves	Kentucky	Tim Hendrick	$ 10,000	$ 58,700
PG96-40	Technical Assistance for Meat Goat Marketing	Kentucky	Neil Hoffman	$ 8,900	$ 4,062
PG96-41	Grasslands Matua and Grasslands Gala in the Tennessee Valley as an Alternative to Fescue and Ryegrass.	Mississippi	Tulon McKee, Jr	$ 9,900	$ 4,050
PG96-42	Low Input Sustainable Agriculture Short Course	Tennessee	Alexander McGregor	$ 9,650	$ 16,650
PG96-43	Sustainable Cultivation of Medicinal Herbs as an Alternative to Tobacco as a Cash Crop.	Tennessee	Paul D. Miller	$ 5,004	$ 4,650
PG96-44	Alternatives to Chemicals in the Peanut Cotton Rotation	North Carolina	Hubert Morris	$ 9,366	$ 9,450
PG96-45	Grazing Alternatives to Tall Fescue for Stocker Cattle	Tennessee	Chris Pitts	$ 9,982	$ 79,114
FS97-46	Sustainability Starts at Home-Building Regional Self Reliance through Agritourism	Kentucky	Karen Armstrong-Cummings	$9,580	$9,160
FS97-48	Evaluation of Mycorrhizal Innoculation on Growth and Quality of Three Eastern North Carolina Christmas Tree Species	North Carolina	Dorsey Daniel	$ 650	$ 200
FS97-49	Crop Production Systems for Nonchemical Control of Reniform Nematodes	Alabama	Richard Edgar	$8,892	$14,087
FS97-50	Effects of Conservation Tillage on Water Quality in Southern Texas	Texas	Charles Eubanks	$8,000	$11,000
FS97-51	Effect of Different Application Rates of Swine Lagoon Effluent on Corn and Wheat	North Carolina	John Hart	$2,317	$6,699
FS97-52	Sustainable Pumpkin Production in the Southeast	Alabama	Dwight N. James	$4,655	$3,172

Active Producer Projects

Project #	Project Title	State	Project Coordinator	SARE Funds	Matching Funds
FS97-53	Cool Season and Warm Season Grasses to Stabilize Erodible Soils and Increase Profitability	Texas	David Kearney	$10,000	$15,360
FS97-54	Forest Site Preparation With Swine	North Carolina	Thomas Livingston	$5,088	$2,675
FS97-55	Overwintering Survival of Kentucky Honeybees	Kentucky	Mark Q. Lee	$5,283	$3,258
FS97-56	Managed Grazing System to Increase Sustainability	Kentucky	Evan McCord	$2,630	$4,770
FS97-57	Effect of Limited Environmental Controls on Shiitake Mushroom Production in the Southern Coastal Plain.	Florida	Charles McRae	$9,990	$16,621
FS97-58	Evaluation of an Alternative Low-Input Production System For Fresh Market Tomato	Georgia	Greg and Dale Murray	$5,109	$5,734
FS97-60	Economics of Season Extension Cut Flower Production	Oklahoma	Vicki Stamback	$8,100	$15,100
FS97-61	Algae-Based Winter Feed for Small-Scale Goat Farm Operations	Georgia	Rosemarie Szostak	$7,907	$2,330
FS97-62	Maximizing Corn Production Through Tillage Methods, Cultivar and Fertilization in the Mountains of Southeast Kentucky	Kentucky	David Teague	$4,955	$7,456
FS97-63	Sustainable Wheat Management Systems	Oklahoma	Curtis Torrance	$9,344	$5,070
FS97-64	Evaluation of a Low-Cost Innovative Ensiling System for Small to Medium Dairy Operations.	Alabama	David and Leianne Wright	$10,000	$10,800

Active Professional Development Projects

Project #	Project Title	Lead Institution	Project Coordinator	SARE Funds	Matching Funds
LST96-10	Sustainable Small-Scale Agricultural Development Training Project	Southern University	Adell Brown	$ 25,701	$ 25,701
LST96-11	Southern Gathering on Agricultural Problem-Solving	University of Kentucky	R.J. Hustedde	$ 52,000	$ 52,000
LST96-12	Facilitating Farmer to Farmer Networks: An Experimental Approach	University of Florida	Marilyn E. Swisher	$ 80,997	$ 80,997
LST96-13	Sustainable Agricultural Marketing through Collaborative Policy Development	Delta Land and Community, Inc.	James V. Worstell	$ 40,900	$ 40,900
ES97-14	Southern Region Sustainable Agriculture Training Consortium	North Carolina State University	Roger Crickenberger	$ 232,599	$ 8,694
ES97-15	Kentucky Cooperative Extension System Training Project	Kentucky State University	Marion Simon	$ 50,000	$ 79,250
ES97-16	Developing Trained Professionals and Teaching Aids to Support Educational Programs Addressing Management of Stored Grain in the Southeast	University of Georgia	Steve Brown	$ 38,150	$ 38,150
ES97-17	Overcoming Training Obstacles: A Realistic Cost-Effective Approach	South Carolina State University	Charles Artis	$ 10,000	$ 10,000
ES96-18	The First Requirement of Agriculture Sustainability: Efficient Mangement of Available Resources	South Carolina State University	Charles Artis	$ 60,000	$ 60,000
ES97-19	Nuisances in the Community: Training on the Issues and the Methods of Mediation	National Center for Ag. Law Res. and Info.	Jamie Simms Hipp	$ 56,000	$ 14,000
ES97-20	State Training in Integrated Erosion Control Systems	Oklahoma State University	Gerrit Cuperas	$70,013	$ 43,849
ES97-21	State Training Enhancement Project to Ensure Effective Sustainable Agriculture Training in Integrated Erosion Control Systems	Oklahoma State University	Gerrit Cuperas	$ 10,000	$ 7,861
ES97-24	Barriers to Sustainable Agriculture Training in Oklahoma	Oklahoma State University	Derrell Peel	$ 10,000	$ 10,400
ES97-25	Building Capacity in Sustainable Agriculture: A Comprehensive Training Program in Organic Farming Systems	North Carolina State University	Nancy Creamer	$ 97,500	$ 20,592
ES97-26	Community Food Security & Marketing Capacity Development in Kentucky	Commodity Growers Cooperative	Karen Armstrong-Cummings	$ 79,970	$ 143,500

Active Professional Development Projects

Project #	Project Title	Lead Institution	Project Coordinator	SARE Funds	Matching Funds
ES97-27	Training Program Targeting Integrated Cow/Calf Operation Management	Oklahoma State University	Steven Smith	$ 54,340	$ 154,992
ES97-28	Grassroots Empowerment in Kentucky's Local Conservation Districts: Leadership Training on Sustainable Land and Water Quality Management Practices	Kentucky Division of Conservation	Stephen Coleman	$ 86,280	$ 25,090
ES97-29	Implementing Tennessee's Strategic Plan for Sustainable Agriculture: Utilizing On-Farm Case Studies for Teaching Advanced Management and Marketing to Extension	University of Tennessee	Clark Garland	$ 10,000	$ 12,000
ES97-30	Integrated Production of Sustainable Crops for Small Farmers in North Florida	University of Florida	Gary Knox	$ 8,375	$ 23,799
ES97-31	Development of Sustainable Checksheet, Manual and Workshops	NCAT/ ATTRA	Ron Morrow	$ 69,936	$ 26,500
ES97-32	Responding to Expressed Needs: Regional Training with Dairy Systems Manual and Software	University of Kentucky	Steve Isaacs	$ 48,500	$ 37,500
ES97-33	Alternative Sustainable Agriculture Practices for Selected Crops in Puerto Rico Puerto Rico Extension Service,	University of Puerto Rico	Miguel Monroig-Ingles	$ 10,000	$ 15,000
ES97-34	Multi-state, Value-added Team Building in the Northern Mississippi River Delta Region	Delta Land & Community, Inc.	Jim Worstell	$ 20,000	$ 5,000
ES97-35	Integrated Strategic Plan for Sustainable Agriculture	University of Puerto Rico	Hipolito O'Farrill	$ 25,740	$ 41,300
ES97-36	Sustainable Agriculture Training Initiative for Texas	Texas A&M University	Nancy Roe	$ 70,136	$ 21,032

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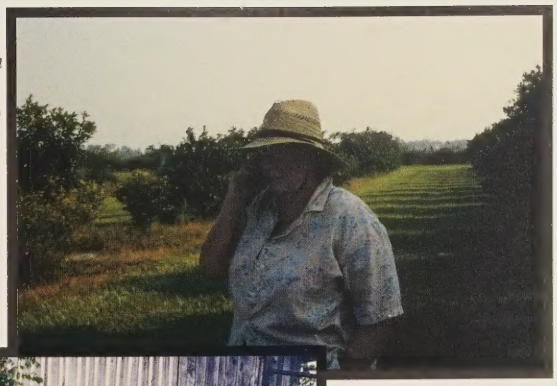
(Right) Pat Simpson talks to son Glenn who is using a Producer Grant to clean effluent from their citrus grove. Photo by John Mayne. (PG95-30)



(Above) Compost workshops were the foundation of this Producer Grant project in Puerto Rico.(PG95-28)

(Left) An egg cluster on cheese cloth swatch pinned to the underside of a tomato plant leaf is used to monitor egg parasitism and predation. Photo by Vernon Schmidt. (AS94-13)

(Left) Composting is just one of the hands-on educational activities spanning everything from soil fertility and vegetable production to marketing and dairying in this systems project. Photo by Salley Causey. (LS97-84)

Making use of technology to disseminate project results, a video crew captures a farmer's experience with reseeding clover covers. Photo by Seth Dabney. (LS93-55)

(Above) Aerial view of constructed wetland in Crossville, Alabama. (AS94-16)

(Right) Field borders of native vegetation along a drainage ditch between soybean and corn crops provide habitat for quail while also protecting water quality in North Carolina. Photo by Steve Lawrence. (LS95-65)

(Above) A field day at a farm in Aguas Buenas, Puerto Rico, demonstrates the benefits of intercropping beans with banana. Photo by L.C. Liu. (LS95-72).

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The 24-hour turnip. *A rapid post-harvest sorting, cleaning and packing system allows project farmers in south Georgia to move produce from their fields to Harry's Farmers Market in Atlanta in less than 24 hours. The direct marketing means farmers make more profit, and Harry's customers get fresher produce free of post-harvest chemicals often used for long hauls.*

Besides the marketing aspect of the project, the farmers are also learning to diversify their crops and use fewer chemicals in production. Photo by Freddie Payton. (LS97-87)